

Appendix A: Detailed Electronic Database Search Strategies

PubMed Strategy

(Heart Failure [mh] OR "heart failure"[tiab] OR "Cardiac Failure" [tiab] OR "Myocardial Failure" [tiab] OR "Heart Decompensation"[tiab]OR "Left Ventricular Dysfunction" [tiab] OR cardiomyopathy[tiab]) AND ("cardiac resynchronization therapy"[mh] OR resynchronization [tiab] OR resynchronisation [tiab] OR defibrillators [mh] OR defibrillators [tiab] OR defibrillator [tiab]OR biventricular[tiab] OR pacing[tiab] OR "pacemaker"[tiab] OR "pacemakers"[tiab] OR pacemaker[mh])AND "1995/01/01"[PDat] : "2018/12/31"[PDat] NOT (animals[mh] NOT Humans[mh]) AND English[lang] NOT (letter[pt] OR comment[pt] OR editorial[pt] OR review[pt])

Embase Strategy

'heart failure'/exp OR 'heart failure':ab,ti OR 'cardiac failure':ab,ti OR 'myocardial failure':ab,ti OR 'heart decompensation':ab,ti OR 'left ventricular dysfunction':ab,ti OR cardiomyopathy:ab,ti AND ('cardiac resynchronization therapy'/exp OR resynchronization:ab,ti ORresynchronisation:ab,ti OR 'defibrillator'/exp OR defibrillators:ab,ti OR defibrillator:ab,ti OR biventricular:ab,ti OR pacing:ab,ti ORpacemaker:ab,ti OR pacemakers:ab,ti OR 'artificial heart pacemaker'/exp) NOT ('animal'/exp NOT 'human'/exp) AND [english]/lim AND ([article]/lim OR [article in press]/lim) AND [embase]/lim AND [1995-2018]/py

The Cochrane Central Register of Controlled Trials (CENTRAL) Strategy

- #1 MeSH descriptor: [Heart Failure] explode all trees 13506
- #2 "heart failure":ti,ab,kw 29237
- #3 "Cardiac Failure":ti,ab,kw 1143
- #4 "Myocardial Failure":ti,ab,kw 43
- #5 "Heart Decompensation":ti,ab,kw 13
- #6 "Left Ventricular Dysfunction":ti,ab,kw 2034
- #7 cardiomyopathy:ti,ab,kw 4118
- #8 "Cardiac Decompensation":ti,ab 59
- #8 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 34104
- #9 MeSH descriptor: [Cardiac Resynchronization Therapy] explode all trees 528
- #10 resynchronization:ti,ab,kw 1697
- #11 resynchronisation:ti,ab,kw 1213
- #12 MeSH descriptor: [Defibrillators] explode all trees 1610
- #13 defibrillators:ti,ab,kw 2001
- #14 defibrillator:ti,ab,kw 2907
- #15 biventricular:ti,ab,kw 1320
- #16 pacing:ti,ab,kw 5963
- #17 pacemaker:ti,ab,kw 2833
- #18 pacemakers:ti,ab,kw 1721
- #19 MeSH descriptor: [Pacemaker, Artificial] explode all trees 1320
- #20 #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 10732
- #21 #8 and #20 Publication Date from 1995 to 2018 1971

Appendix B: Forms

Figure B1: Abstract Review Form

Does this article POTENTIALLY apply to ANY of the key questions?

- No
NO, this article DOES NOT apply to any of the Key Questions (check only one reason)
 - Does not evaluate a CRT
 - Study published before 1995
 - No original data (systematic reviews, meta-analysis, editorial, commentary)
 - Not conducted in humans
 - Not in English
 - No full report (e.g. conference or meeting abstract)
 - Study of children only
 - Not relevant to key questions
 - Other: Please specify
- Yes-Include article for full text screening
- Unclear-No abstract or cannot tell from abstract alone --- get it for full-text screen

Flag excluded articles:

- Pull for hand searching "review that applies to one of the questions and likely to contain relevant studies
 - Pull for citation for use in report (i.e., for background)
- [Clear Response](#)

Key Questions

KQ1a: Is cardiac resynchronization therapy with defibrillator (CRT-D) effective in reducing heart failure symptoms, improving myocardial function, reducing hospitalization and/or improving survival in patients with an LVEF≤35% and a QRS duration≥120ms?

KQ1b: What are the clinical predictors of response in Medicare eligible patients who are deemed appropriate candidates for CRT-D devices?

KQ2: What are the adverse effects or complications associated with CRT-D implantation in the Medicare population?

KQ3a: Is cardiac resynchronization therapy in the absence of defibrillator capacity (CRT-P) effective in reducing heart failure symptoms, improving myocardial function, reducing hospitalization and/or improving survival in patients with LVEF≤35% and a QRS duration≥120ms?

KQ3b: What are the clinical predictors of response in Medicare eligible patients who are deemed appropriate candidates for CRT-P devices?

KQ4: What are the adverse effects or complications associated with CRT-P implantation in the Medicare population?

KQ5: What is the effectiveness of CRT-D versus CRT-P in reducing heart failure symptoms, improving myocardial function, reducing hospitalization and/or improving survival in patients with LVEF≤35% and a QRS duration≥120ms?

KQ6: What are the adverse effects or complications associated with CRT-D versus CRT-P implantation in the Medicare population?

and go to or [Skip to Next](#)

Figure B2: Article Review Form

Refid: 1, There and Back Again: A Review of Residency and Return Migrations in Sharks, with Implications for Population Structure and Management.
Chapman DD, Feldheim KA, Papastamatiou Y, Hueter RE

Submit Form

and go to

or Skip to Next



Does this article POTENTIALLY apply to ANY of the key questions?

[Please click here to see the eligibility criteria](#)

No

NO, this article DOES NOT apply to any of the Key Questions (check only one reason)

- Does not evaluate a CRT
- Not conducted in humans
- No original data (systematic reviews, meta-analysis, editorial, commentary)
- No full report (e.g. conference or meeting abstract)
- Not in English
- Study of children only
- Single case study
- Addresses effectiveness questions only and is not RCT
- Population inclusion criteria do not fall within the QRS \geq 120ms range and LVEF \leq 35% OR QRS and LVEF not specified
- Does not address outcome of interest
- Other: Please specify

Yes

Comments:

Data Abstraction Form

Figure B3:Study characteristics

- Author, Year, RefID
- Does this study have a name? If YES please specify
- Is this a secondary study of a large clinical trial? -If YES please specify
- Planned length of follow-up -specify (months)
- Study Design
- Other Study design-Specify
- Device type
- Device Name
- Other Device Name
- Funding source
- OtherFunding-Specify

Figure B4: Participants characteristics

- Author, Year,Refid
- Arm
- Arm name
- Number at baseline
- Women, n
- Women, (%)
- Mean Age, years
- Median Age, years
- Range Age, years
- SD Age, years
- White, n
- White,(%)
- African-American, n
- African-American, (%)
- Other, n,
- Other,(%)
- Ischemic cardiomyopathy n
- Ischemic cardiomyopathy (%)
- Atrial fibrillation, n
- Atrial fibrillation, (%)
- QRS interval, mean; QRS interval, median; QRS interval, range; QRS interval, SD
- Creatinine ; Creatinine-unit
- LBBB,n; LBBB,%
- RBBB,n; RBBB,(%)
- QRS morphology -IVCD, n; QRS morphology -IVCD, %
- QRS morphology -PBBBblock, n; QRS morphology -PBBBblock,%
- NYHA class I, n; NYHA class I, (%)
- NYHA class II, n; NYHA class II, (%)
- NYHA class III, n; NYHA class III, (%)
- NYHA class IV, n; NYHA class IV, (%)
- LVEF, mean; LVEF, median LVEF, range
- GFR (Glomerular filtration rate); GFR -Please enter UNIT
- Other - please specify

Figure B4: Effectiveness outcomes

The following apply to the outcomes of, 6 minute hall walk distance, Minnesota living with Heart failure Inventory score (MLHFI), SF-36, LVESV/volume index, LVEDV/volume index, LVEF, Clinical composite score.

- Author, year, RefID
- Arm name
- Outcome unit -if applicable
- Baseline N
- Baseline outcome, mean
- Baseline outcome, SD
- Timepoint(s)
- N at time point(s)
- mean-Outcome at timepoint(s)
- SD-Outcome at timepoint(s)
- Within arm comparison-Select Measurement
 - Within arm comparison-Enter Value Relative risk
 - Relative hazard
 - Odd ratio
 - risk difference
 - 95% CI
 - Standard error
 - Standard deviation
 - p value
- Between arm comparison - Select Measurement
 - Between arm comparison - Enter Valuse
 - Comparator Arm
 - Relative risk
 - Relative hazard
 - Odd ratio
 - risk difference
 - 95% CI
 - Standard error
 - Standard deviation
 - p value

Figure B5: Hospitalization for heart failure and All-cause mortality outcome

- Author, year, RefID
- Arm name
- N for analysis
- Time point
- n of PATIENTS with outcomes
- % of PATIENTS with outcomes
- n of EVENTS with outcomes
- % of EVENTS with outcomes
- Within arm comparison-Select Measurement
 - Within arm comparison-Enter Value Relative risk
 - Relative hazard
 - Odd ratio
 - risk difference
 - 95% CI
 - Standard error
 - Standard deviation
 - p value
- Between arm comparison - Select Measurement
 - Between arm comparison - Enter Valuse
 - Comparator Arm
 - Relative risk
 - Relative hazard
 - Odd ratio
 - risk difference
 - 95% CI
 - Standard error
 - Standard deviation
 - p value

Figure B6: Harms Outcomes

- Author, year, RefID
- Overall Study-If applicable
- Arm name
- Select Outcome
- IF Length of hospital stay -Enter Value
- IF Length of hospital stay -Select Unit
- N for analysis
- Time point (s)
- n of PATIENTS with outcomes
- % of PATIENTS with outcomes
- n of EVENTS with outcomes
- % of EVENTS with outcomes
- Within arm comparison-Select Measurement
 - Within arm comparison-Enter Value Relative risk
 - Relative hazard
 - Odd ratio
 - risk difference
 - 95% CI
 - Standard error
 - Standard deviation
 - p value
- Between arm comparison - Select Measurement
 - Between arm comparison - Enter Value
 - Comparator Arm
 - Relative risk
 - Relative hazard
 - Odd ratio
 - risk difference
 - 95% CI
 - Standard error
 - Standard deviation
 - p value

Appendix C: List of Included and Excluded Studies

Included Articles

1. Abraham WT, Fisher WG, Smith AL, et al. Cardiac resynchronization in chronic heart failure. *N Engl J Med*. 2002 Jun 13;346(24):1845-53.
2. Abraham WT, Young JB, Leon AR, et al. Effects of cardiac resynchronization on disease progression in patients with left ventricular systolic dysfunction, an indication for an implantable cardioverter-defibrillator, and mildly symptomatic chronic heart failure. *Circulation*. 2004 Nov 2;110(18):2864-8.
3. Adelstein EC, Liu J, Jain S, et al. Clinical outcomes in cardiac resynchronization therapy-defibrillator recipients 80 years of age and older. *Europace*. 2016 Mar;18(3):420-7. doi: 10.1093/europace/euv222. PMID: 26487669.
4. Anand IS, Carson P, Galle E, et al. Cardiac resynchronization therapy reduces the risk of hospitalizations in patients with advanced heart failure: results from the Comparison of Medical Therapy, Pacing and Defibrillation in Heart Failure (COMPANION) trial. *Circulation*. 2009 Feb 24;119(7):969-77.
5. Arshad A, Moss AJ, Foster E, et al. Cardiac resynchronization therapy is more effective in women than in men: the MADIT-CRT (Multicenter Automatic Defibrillator Implantation Trial with Cardiac Resynchronization Therapy) trial. *J Am Coll Cardiol*. 2011 Feb 15;57(7):813-20.
6. Auricchio A, Gold MR, Brugada J, et al. Long-term effectiveness of the combined minute ventilation and patient activity sensors as predictor of heart failure events in patients treated with cardiac resynchronization therapy: Results of the Clinical Evaluation of the Physiological Diagnosis Function in the PARADYM CRT device Trial (CLEPSYDRA) study. *Eur J Heart Fail*. 2014;16(6):663-70. doi: 10.1002/ejhf.79.
7. Azizi M, Castel MA, Behrens S, et al. Experience with coronary sinus lead implantations for cardiac resynchronization therapy in 244 patients. *Herzschrittmacherther Elektrophysiol*. 2006 Mar;17(1):13-8.
8. Barra S, Providencia R, Boveda S, et al. Device complications with addition of defibrillation to cardiac resynchronisation therapy for primary prevention. *Heart*. 2018 Sep;104(18):1529-35. doi: 10.1136/heartjnl-2017-312546. PMID: 29540431.
9. Barsheshet A, Goldenberg I, Moss AJ, et al. Response to preventive cardiac resynchronization therapy in patients with ischaemic and nonischaemic cardiomyopathy in MADIT-CRT. *Eur Heart J*. 2011 Jul;32(13):1622-30.
10. Bhatt AG, Musat DL, Milstein N, et al. The Efficacy of His Bundle Pacing: Lessons Learned From Implementation for the First Time at

- an Experienced Electrophysiology Center. *JACC Clin Electrophysiol.* 2018 Nov;4(11):1397-406. doi: 10.1016/j.jacep.2018.07.013. PMID: 30466843.
11. Bilchick KC, Kamath S, DiMarco JP, et al. Bundle-branch block morphology and other predictors of outcome after cardiac resynchronization therapy in Medicare patients. *Circulation.* 2010 Nov 16;122(20):2022-30.
 12. Birnie DH, Ha A, Higginson L, et al. Impact of QRS morphology and duration on outcomes after cardiac resynchronization therapy: Results from the Resynchronization-Defibrillation for Ambulatory Heart Failure Trial (RAFT). *Circ Heart Fail.* 2013 Nov;6(6):1190-8.
 13. Biton Y, Kutuyifa V, Cygankiewicz I, et al. Relation of QRS Duration to Clinical Benefit of Cardiac Resynchronization Therapy in Mild Heart Failure Patients Without Left Bundle Branch Block: The Multicenter Automatic Defibrillator Implantation Trial with Cardiac Resynchronization Therapy Substudy. *Circ Heart Fail.* 2016 Feb;9(2):e002667. doi: 10.1161/circheartfailure.115.002667. PMID: 26823498.
 14. Biton Y, Ng CY, Xia X, et al. Baseline adverse electrical remodeling and the risk for ventricular arrhythmia in Cardiac Resynchronization Therapy Recipients (MADIT CRT). *J Cardiovasc Electrophysiol.* 2018 Jul;29(7):1017-23. doi: 10.1111/jce.13640. PMID: 29846992.
 15. Biton Y, Zareba W, Goldenberg I, et al. Sex Differences in Long-Term Outcomes With Cardiac Resynchronization Therapy in Mild Heart Failure Patients With Left Bundle Branch Block. *J Am Heart Assoc.* 2015 Jun 29;4(7)doi: 10.1161/jaha.115.002013. PMID: 26124205.
 16. Bossard M, Sticherling C, Kuhne M, et al. Outcome of patients with cardiac resynchronisation defibrillator therapy and a follow-up of at least five years after implant. *Swiss Med Wkly.* 2014 2014;144:w13938.
 17. Boven NV, Theuns D, Bogaard K, et al. Atrial Fibrillation in Cardiac Resynchronization Therapy with a Defibrillator: A Risk Factor for Mortality, Appropriate and Inappropriate Shocks. *J Cardiovasc Electrophysiol.* 2013 2013 Jun 17.
 18. Bristow MR, Saxon LA, Boehmer J, et al. Cardiac-resynchronization therapy with or without an implantable defibrillator in advanced chronic heart failure. *N Engl J Med.* 2004 2004 May 20;350(21):2140-50.
 19. Carson P, Anand I, O'Connor C, et al. Mode of death in advanced heart failure: the Comparison of Medical, Pacing, and Defibrillation Therapies in Heart Failure (COMPANION) trial. *J Am Coll Cardiol.* 2005 2005 Dec 20;46(12):2329-34.
 20. Cazeau S, Leclercq C, Lavergne T, et al. Effects of multisite biventricular pacing in patients with heart failure and intraventricular conduction delay. *N Engl J Med.* 2001 2001 Mar 22;344(12):873-80.
 21. Cleland JG, Calvert MJ, Verboven Y, et al. Effects of cardiac resynchronization therapy on long-term quality of life: an analysis from the CARDiac Resynchronisation-Heart

- Failure (CARE-HF) study. *Am Heart J.* 2009 2009 Mar;157(3):457-66.
22. Cleland JG, Daubert JC, Erdmann E, et al. The effect of cardiac resynchronization on morbidity and mortality in heart failure. *N Engl J Med.* 2005 2005 Apr 14;352(15):1539-49.
 23. Cleland JG, Freemantle N, Daubert JC, et al. Long-term effect of cardiac resynchronisation in patients reporting mild symptoms of heart failure: a report from the CARE-HF study. *Heart.* 2008 2008 Mar;94(3):278-83.
 24. Cleland JG, Freemantle N, Erdmann E, et al. Long-term mortality with cardiac resynchronization therapy in the Cardiac Resynchronization-Heart Failure (CARE-HF) trial. *Eur J Heart Fail.* 2012 2012 Jun;14(6):628-34.
 25. Cleland JGF, Daubert J-C, Erdmann E, et al. Longer-term effects of cardiac resynchronization therapy on mortality in heart failure [the CARDiac RESynchronization-Heart Failure (CARE-HF) trial extension phase]. *Eur. Heart J.* 2006 2006;27(16):1928-32.
 26. Crossley GH, Biffi M, Johnson B, et al. Performance of a novel left ventricular lead with short bipolar spacing for cardiac resynchronization therapy: primary results of the Attain Performa quadripolar left ventricular lead study. *Heart Rhythm.* 2015 Apr;12(4):751-8. doi: 10.1016/j.hrthm.2014.12.019. PMID: 25533587.
 27. de Cock CC, van Campen CM, Visser CA. Major dissection of the coronary sinus and its tributaries during lead implantation for biventricular stimulation: angiographic follow-up. *Europace.* 2004 2004 Jan;6(1):43-7.
 28. Diab IG, Hunter RJ, Kamdar R, et al. Does ventricular dyssynchrony on echocardiography predict response to cardiac resynchronisation therapy? A randomised controlled study. *Heart.* 2011 2011 Sep;97(17):1410-6.
 29. Doring M, Ebert M, Dagues N, et al. Cardiac resynchronization therapy in the ageing population - With or without an implantable defibrillator? *Int J Cardiol.* 2018 Jul 15;263:48-53. doi: 10.1016/j.ijcard.2018.03.087. PMID: 29754922.
 30. Duray GZ, Israel CW, Pajitnev D, et al. Upgrading to biventricular pacing/defibrillation systems in right ventricular paced congestive heart failure patients: prospective assessment of procedural parameters and response rate. *Europace.* 2008 2008 Jan;10(1):48-52.
 31. Echouffo-Tcheugui JB, Masoudi FA, Bao H, et al. Diabetes Mellitus and Outcomes of Cardiac Resynchronization With Implantable Cardioverter-Defibrillator Therapy in Older Patients With Heart Failure. *Circ Arrhythm Electrophysiol.* 2016 Aug;9(8)doi: 10.1161/circep.116.004132. PMID: 27489243.
 32. Essebag V, Joza J, Birnie DH, et al. Incidence, predictors, and procedural results of upgrade to resynchronization therapy: the RAFT upgrade substudy. *Circ Arrhythm Electrophysiol.* 2015 Feb;8(1):152-8. doi: 10.1161/circep.114.001997. PMID: 25417892.
 33. Forleo GB, Di Biase L, Panattoni G, et al. Improved implant and postoperative lead performance in

- CRT-D patients implanted with a quadripolar left ventricular lead. A 6-month follow-up analysis from a multicenter prospective comparative study. *J Interv Card Electrophysiol.* 2015 Jan;42(1):59-66. doi: 10.1007/s10840-014-9956-1. PMID: 25504267.
34. Friedman DJ, Singh JP, Curtis JP, et al. Comparative Effectiveness of CRT-D Versus Defibrillator Alone in HF Patients With Moderate-to-Severe Chronic Kidney Disease. *J Am Coll Cardiol.* 2015 Dec 15;66(23):2618-29. doi: 10.1016/j.jacc.2015.09.097. PMID: 26670062.
 35. Garikipati NV, Mittal S, Chaudhry F, et al. Comparison of endovascular versus epicardial lead placement for resynchronization therapy. *Am J Cardiol.* 2014 2014 Mar 1;113(5):840-4.
 36. Ghio S, Freemantle N, Scelsi L, et al. Long-term left ventricular reverse remodelling with cardiac resynchronization therapy: results from the CARE-HF trial. *Eur J Heart Fail.* 2009 2009 May;11(5):480-8.
 37. Gillis AM, Kerr CR, Philippon F, et al. Impact of Cardiac Resynchronization Therapy on Hospitalizations in the Resynchronization-Defibrillation for Ambulatory Heart Failure Trial. *Circulation.* 2014 2014 Mar 7.
 38. Goldenberg I, Kutiyafa V, Klein HU, et al. Survival with cardiac-resynchronization therapy in mild heart failure. *New England Journal of Medicine.* 2014;370(18):1694-701. doi: 10.1056/NEJMoa1401426.
 39. Goldenberg I, Moss AJ, Hall WJ, et al. Predictors of response to cardiac resynchronization therapy in the Multicenter Automatic Defibrillator Implantation Trial with Cardiac Resynchronization Therapy (MADIT-CRT). *Circulation.* 2011 2011 Oct 4;124(14):1527-36.
 40. Gras D, Bocker D, Lunati M, et al. Implantation of cardiac resynchronization therapy systems in the CARE-HF trial: procedural success rate and safety. *Europace.* 2007 2007 Jul;9(7):516-22.
 41. Gras D, Leclercq C, Tang AS, et al. Cardiac resynchronization therapy in advanced heart failure the multicenter InSync clinical study. *Eur J Heart Fail.* 2002 2002 Jun;4(3):311-20.
 42. Haugaa KH, Marek JJ, Ahmed M, et al. Mechanical dyssynchrony after cardiac resynchronization therapy for severely symptomatic heart failure is associated with risk for ventricular arrhythmias. *J Am Soc Echocardiogr.* 2014 2014 Aug;27(8):872-9.
 43. Healey JS, Hohnloser SH, Exner DV, et al. Cardiac resynchronization therapy in patients with permanent atrial fibrillation: results from the Resynchronization for Ambulatory Heart Failure Trial (RAFT). *Circ Heart Fail.* 2012 2012 Sep 1;5(5):566-70.
 44. Higgins SL, Hummel JD, Niazi IK, et al. Cardiac resynchronization therapy for the treatment of heart failure in patients with intraventricular conduction delay and malignant ventricular tachyarrhythmias. *J Am Coll Cardiol.* 2003 2003 Oct 15;42(8):1454-9.
 45. Hoke U, Putter H, Van Der Velde ET, et al. Left ventricular reverse remodeling, device-related adverse events, and long-term outcome after cardiac resynchronization therapy in

- the elderly. *Circ Cardiovasc Qual Outcomes*. 2014 May;7(3):437-44. doi: 10.1161/circoutcomes.113.000821. PMID: 24823954.
46. Hsu JC, Solomon SD, Bourgoun M, et al. Predictors of super-response to cardiac resynchronization therapy and associated improvement in clinical outcome: the MADIT-CRT (multicenter automatic defibrillator implantation trial with cardiac resynchronization therapy) study. *J Am Coll Cardiol*. 2012 2012 Jun 19;59(25):2366-73.
 47. Jamerson D, McNitt S, Polonsky S, et al. Early Procedure-Related Adverse Events by Gender in MADIT-CRT. *J Cardiovasc Electrophysiol*. 2014 2014 Sep;25(9):985-9.
 48. Kalscheur MM, Saxon LA, Lee BK, et al. Outcomes of cardiac resynchronization therapy in patients with intermittent atrial fibrillation or atrial flutter in the COMPANION trial. *Heart Rhythm*. 2017 Jun;14(6):858-65. doi: 10.1016/j.hrthm.2017.03.024. PMID: 28323173.
 49. Khazanie P, Greiner MA, Al-Khatib SM, et al. Comparative Effectiveness of Cardiac Resynchronization Therapy Among Patients With Heart Failure and Atrial Fibrillation: Findings From the National Cardiovascular Data Registry's Implantable Cardioverter-Defibrillator Registry. *Circ Heart Fail*. 2016 Jun;9(6)doi: 10.1161/circheartfailure.115.002324. PMID: 27296396.
 50. Killu AM, Mazo A, Grupper A, et al. Super-response to cardiac resynchronization therapy reduces appropriate implantable cardioverter defibrillator therapy. *Europace*. 2017 Aug 4doi: 10.1093/europace/eux235. PMID: 29016821.
 51. Killu AM, Wu JH, Friedman PA, et al. Outcomes of cardiac resynchronization therapy in the elderly. *Pacing Clin Electrophysiol*. 2013 2013 Jun;36(6):664-72.
 52. Knight BP, Desai A, Coman J, et al. Long-term retention of cardiac resynchronization therapy. *J Am Coll Cardiol*. 2004 2004 Jul 7;44(1):72-7.
 53. Kober L, Thune JJ, Nielsen JC, et al. Defibrillator Implantation in Patients with Nonischemic Systolic Heart Failure. *N Engl J Med*. 2016 Sep 29;375(13):1221-30. doi: 10.1056/NEJMoa1608029. PMID: 27571011.
 54. Krahn AD, Snell L, Yee R, et al. Biventricular pacing improves quality of life and exercise tolerance in patients with heart failure and intraventricular conduction delay. *Can J Cardiol*. 2002 2002 Apr;18(4):380-7.
 55. Kronborg MB, Johansen JB, Haarbo J, et al. Association between implantable cardioverter-defibrillator therapy and different lead positions in patients with cardiac resynchronization therapy. *Europace*. 2018 Sep 1;20(9):e133-e9. doi: 10.1093/europace/eux296. PMID: 29036292.
 56. Kuhlkamp V. Initial experience with an implantable cardioverter-defibrillator incorporating cardiac resynchronization therapy. *J Am Coll Cardiol*. 2002 2002 Mar 6;39(5):790-7.

57. Laish-Farkash A, Bruoha S, Khalameizer V, et al. Multisite cardiac resynchronization therapy for traditional and non-traditional indications. *J Interv Card Electrophysiol.* 2018 Mar;51(2):143-52. doi: 10.1007/s10840-018-0316-4. PMID: 29442199.
58. Landolina M, Gasparini M, Lunati M, et al. Long-term complications related to biventricular defibrillator implantation: rate of surgical revisions and impact on survival: insights from the Italian Clinical Service Database. *Circulation.* 2011 Jun 7;123(22):2526-35.
59. Leclercq C, Burri H, Curnis A, et al. Cardiac resynchronization therapy non-responder to responder conversion rate in the more response to cardiac resynchronization therapy with MultiPoint Pacing (MORE-CRT MPP) study: results from Phase I. *Eur Heart J.* 2019 Mar 11doi: 10.1093/eurheartj/ehz109. PMID: 30859220.
60. Leclercq C, Cazeau S, Lellouche D, et al. Upgrading from single chamber right ventricular to biventricular pacing in permanently paced patients with worsening heart failure: The RD-CHF Study. *Pacing Clin Electrophysiol.* 2007 2007 Jan;30 Suppl 1:S23-30.
61. Leclercq C, Walker S, Linde C, et al. Comparative effects of permanent biventricular and right-univentricular pacing in heart failure patients with chronic atrial fibrillation. *Eur Heart J.* 2002 2002 Nov;23(22):1780-7.
62. Looi KL, Gavin A, Sidhu K, et al. Utilization of cardiac resynchronization therapy in patients with heart failure in the Northern Region of New Zealand. *J Arrhythm.* 2018((Looi K.-L., khanglil@adhb.govt.nz; Sidhu K.; Cooper L.; Lever N.) Green Lane Cardiovascular Service, Auckland City Hospital, Auckland, New Zealand)doi: 10.1002/joa3.12134.
63. Looi KL, Sidhu K, Cooper L, et al. Long-term outcomes of heart failure patients who received primary prevention implantable cardioverter-defibrillator: An observational study. *J Arrhythm.* 2018 Feb;34(1):46-54. doi: 10.1002/joa3.12027. PMID: 29721113.
64. Lozano I, Bocchiardo M, Achteлик M, et al. Impact of biventricular pacing on mortality in a randomized crossover study of patients with heart failure and ventricular arrhythmias. *Pacing Clin Electrophysiol.* 2000 2000 Nov;23(11 Pt 2):1711-2.
65. Luo NS, Yuan WL, Lin YQ, et al. Potential proarrhythmic effect of cardiac resynchronization therapy during perioperative period: data from a single cardiac center. *Chin Med J (Engl).* 2010 2010 Sep;123(17):2295-8.
66. Masoudi FA, Mi X, Curtis LH, et al. Comparative effectiveness of cardiac resynchronization therapy with an implantable cardioverter-defibrillator versus defibrillator therapy alone: a cohort study. *Ann Intern Med.* 2014 2014 May 6;160(9):603-11.
67. Mortensen PT, Sogaard P, Mansour H, et al. Sequential biventricular pacing: evaluation of safety and efficacy. *Pacing Clin Electrophysiol.* 2004 2004 Mar;27(3):339-45.
68. Moss AJ, Hall WJ, Cannom DS, et al. Cardiac-resynchronization therapy for the prevention of heart-failure events.

- N Engl J Med. 2009 2009 Oct 1;361(14):1329-38.
69. Nakajima I, Noda T, Kanzaski H, et al. Development of Heart Failure From Transient Atrial Fibrillation Attacks in Responders to Cardiac Resynchronization Therapy. *JACC Clin Electrophysiol.* 2018 Sep;4(9):1227-34. doi: 10.1016/j.jacep.2018.06.010. PMID: 30236398.
 70. Nevzorov R, Porter A, Mostov S, et al. Gender-Related Differences in Outcomes of Patients with Cardiac Resynchronization Therapy. *Isr Med Assoc J.* 2018 May;5(20):311-5. PMID: 29761679.
 71. Niu HX, Hua W, Wang FZ, et al. Complications of cardiac resynchronization therapy in patients with congestive heart failure. *Chin Med J (Engl).* 2006 2006 Mar 20;119(6):449-53.
 72. Ouellet G, Huang DT, Moss AJ, et al. Effect of cardiac resynchronization therapy on the risk of first and recurrent ventricular tachyarrhythmic events in MADIT-CRT. *J Am Coll Cardiol.* 2012 2012 Oct 30;60(18):1809-16.
 73. Pinter A, Mangat I, Korley V, et al. Assessment of resynchronization therapy on functional status and quality of life in patients requiring an implantable defibrillator. *Pacing Clin Electrophysiol.* 2009 2009 Dec;32(12):1509-19.
 74. Ricci RP, Pignalberi C, Landolina M, et al. Ventricular rate monitoring as a tool to predict and prevent atrial fibrillation-related inappropriate shocks in heart failure patients treated with cardiac resynchronisation therapy defibrillators. *Heart.* 2014 2014 Jun;100(11):848-54.
 75. Rickard J, Cheng A, Spragg D, et al. QRS narrowing is associated with reverse remodeling in patients with chronic right ventricular pacing upgraded to cardiac resynchronization therapy. *Heart Rhythm.* 2013 2013 Jan;10(1):55-60.
 76. Romeyer-Bouchard C, Da Costa A, Dauphinot V, et al. Prevalence and risk factors related to infections of cardiac resynchronization therapy devices. *Eur Heart J.* 2010 2010 Jan;31(2):203-10.
 77. Ruwald MH, Solomon SD, Foster E, et al. Left ventricular ejection fraction normalization in cardiac resynchronization therapy and risk of ventricular arrhythmias and clinical outcomes: results from the Multicenter Automatic Defibrillator Implantation Trial With Cardiac Resynchronization Therapy (MADIT-CRT) trial. *Circulation.* 2014 Dec 23;130(25):2278-86. doi: 10.1161/circulationaha.114.011283. PMID: 25301831.
 78. Sabbag A, Goldenberg I, Moss AJ, et al. Predictors and Risk of Ventricular Tachyarrhythmias or Death in Black and White Cardiac Patients: A MADIT-CRT Trial Substudy. *JACC Clin Electrophysiol.* 2016 Aug;2(4):448-55. doi: 10.1016/j.jacep.2016.03.003. PMID: 29759864.
 79. Sapp JL, Parkash R, Wells GA, et al. Cardiac Resynchronization Therapy Reduces Ventricular Arrhythmias in Primary but Not Secondary Prophylactic Implantable Cardioverter Defibrillator Patients: Insight From the Resynchronization

- in Ambulatory Heart Failure Trial. *Circ Arrhythm Electrophysiol.* 2017 Mar;10(3)doi: 10.1161/circep.116.004875. PMID: 28292754.
80. Sardu C, Barbieri M, Santamaria M, et al. Multipolar pacing by cardiac resynchronization therapy with a defibrillators treatment in type 2 diabetes mellitus failing heart patients: impact on responders rate, and clinical outcomes. *Cardiovasc Diabetol.* 2017 Jun 9;16(1):75. doi: 10.1186/s12933-017-0554-2. PMID: 28599667.
 81. Sardu C, Santamaria M, Funaro S, et al. Cardiac electrophysiological alterations and clinical response in cardiac resynchronization therapy with a defibrillator treated patients affected by metabolic syndrome. *Medicine (Baltimore).* 2017 Apr;96(14):e6558. doi: 10.1097/md.0000000000006558. PMID: 28383431.
 82. Schuchert A, Muto C, Maounis T, et al. Lead complications, device infections, and clinical outcomes in the first year after implantation of cardiac resynchronization therapy-defibrillator and cardiac resynchronization therapy-pacemaker. *Europace.* 2013 2013 Jan;15(1):71-6.
 83. Shamoun F, De Marco T, DeMets D, et al. Impact of Degree of Left Ventricular Remodeling on Clinical Outcomes From Cardiac Resynchronization Therapy. *JACC: Heart Failure.* 2019;7(4):281-90. doi: 10.1016/j.jchf.2018.11.004.
 84. Shan P, Su L, Zhou X, et al. Beneficial effects of upgrading to His bundle pacing in chronically paced patients with left ventricular ejection fraction <50. *Heart Rhythm.* 2018 Mar;15(3):405-12. doi: 10.1016/j.hrthm.2017.10.031. PMID: 29081396.
 85. Solomon SD, Foster E, Bourgoun M, et al. Effect of cardiac resynchronization therapy on reverse remodeling and relation to outcome: multicenter automatic defibrillator implantation trial: cardiac resynchronization therapy. *Circulation.* 2010 Sep 7;122(10):985-92. doi: 10.1161/circulationaha.110.955039. PMID: 20733097.
 86. St John Sutton MG, Plappert T, Abraham WT, et al. Effect of cardiac resynchronization therapy on left ventricular size and function in chronic heart failure. *Circulation.* 2003 2003 Apr 22;107(15):1985-90.
 87. Stahlberg M, Braunschweig F, Gadler F, et al. Three year outcome of cardiac resynchronization therapy: a single center evaluation. *Pacing Clin Electrophysiol.* 2005 2005 Oct;28(10):1013-7.
 88. Steffel J, Robertson M, Singh JP, et al. The effect of QRS duration on cardiac resynchronization therapy in patients with a narrow QRS complex: a subgroup analysis of the EchoCRT trial. *Eur Heart J.* 2015 Aug 7;36(30):1983-9. doi: 10.1093/eurheartj/ehv242. PMID: 26009595.
 89. Stockburger M, Moss AJ, Klein HU, et al. Sustained clinical benefit of cardiac resynchronization therapy in non-LBBB patients with prolonged PR-interval: MADIT-CRT long-term follow-up. *Clin Res Cardiol.* 2016 Nov;105(11):944-52. doi:

- 10.1007/s00392-016-1003-z. PMID: 27318807.
90. Strimel W, Koplik S, Chen HR, et al. Safety and effectiveness of primary prevention cardioverter defibrillators in octogenarians. *Pacing Clin Electrophysiol.* 2011 2011 Jul;34(7):900-6.
91. Su H, Bao P, Chen KY, et al. Influence of the Right Ventricular Lead Location on Ventricular Arrhythmias in Cardiac Resynchronization Therapy. *Chin Med J (Engl).* 2018;131(20):2402-9. doi: 10.4103/0366-6999.243560.
92. Swindle JP, Rich MW, McCann P, et al. Implantable cardiac device procedures in older patients: use and in-hospital outcomes. *Arch Intern Med.* 2010 2010 Apr 12;170(7):631-7.
93. Takaya Y, Noda T, Nakajima I, et al. Electrocardiographic predictors of response to cardiac resynchronization therapy in patients with intraventricular conduction delay. *Circ. J.* 2014 2014;78(1):71-7.
94. Tang AS, Wells GA, Talajic M, et al. Cardiac-resynchronization therapy for mild-to-moderate heart failure. *N Engl J Med.* 2010 2010 Dec 16;363(25):2385-95.
95. Theuns DA, Thornton AS, Klootwijk AP, et al. Outcome in patients with an ICD incorporating cardiac resynchronisation therapy: differences between primary and secondary prophylaxis. *Eur J Heart Fail.* 2005 2005 Oct;7(6):1027-32.
96. Tompkins C, Kutuyifa V, McNitt S, et al. Effect on cardiac function of cardiac resynchronization therapy in patients with right bundle branch block (from the Multicenter Automatic Defibrillator Implantation Trial With Cardiac Resynchronization Therapy. *Am J Cardiol.* 2013 2013 Aug 15;112(4):525-9.
97. Vado A, Menardi E, Rossetti G, et al. Single-center experience of a quadripolar pacing lead for cardiac resynchronization therapy. *J Interv Card Electrophysiol.* 2014 2014 Mar;39(2):161-5.
98. Van Boven N, Bogaard K, Ruiters J, et al. Functional response to cardiac resynchronization therapy is associated with improved clinical outcome and absence of appropriate shocks. *J Cardiovasc Electrophysiol.* 2013 2013 Mar;24(3):316-22.
99. Verbrugge FH, De Vusser P, Rivero-Ayerza M, et al. Cardiac resynchronization therapy with or without defibrillator: experience from a high-volume Belgian implantation centre. *Acta Cardiol.* 2013 2013 Feb;68(1):37-45.
100. Verbrugge FH, Dupont M, De Vusser P, et al. Response to cardiac resynchronization therapy in elderly patients ((greater-than or equal to)70 years) and octogenarians. *Eur. J. Heart Fail.* 2013 2013;15(2):203-10.
101. Wikstrom G, Blomstrom-Lundqvist C, Andren B, et al. The effects of aetiology on outcome in patients treated with cardiac resynchronization therapy in the CARE-HF trial. *Eur Heart J.* 2009 2009 Apr;30(7):782-8.
102. Xue C, Hua W, Cai C, et al. Acute and Chronic Changes and Predictive Value of Tpeak-Tend for Ventricular Arrhythmia Risk in Cardiac Resynchronization Therapy Patients. *Chin Med J (Engl).* 2016 Sep 20;129(18):2204-11. doi:

- 10.4103/0366-6999.189916. PMID: 27625093.
103. Young JB, Abraham WT, Smith AL, et al. Combined cardiac resynchronization and implantable cardioversion defibrillation in advanced chronic heart failure: the MIRACLE ICD Trial. *JAMA*. 2003 May 28;289(20):2685-94.
104. Zareba W, Klein H, Cygankiewicz I, et al. Effectiveness of Cardiac Resynchronization Therapy by QRS Morphology in the Multicenter Automatic Defibrillator Implantation Trial-Cardiac Resynchronization Therapy (MADIT-CRT). *Circulation*. 2011 Mar 15;123(10):1061-72.
105. Zhang Q, van Bommel RJ, Fung JW, et al. Tissue Doppler velocity is superior to strain imaging in predicting long-term cardiovascular events after cardiac resynchronisation therapy. *Heart*. 2009 Jul;95(13):1085-90.
106. Ziacchi M, Diemberger I, Corzani A, et al. Cardiac resynchronization therapy: a comparison among left ventricular bipolar, quadripolar and active fixation leads. *Sci Rep*. 2018 Sep 5;8(1):13262. doi: 10.1038/s41598-018-31692-z. PMID: 30185834.
107. Ziacchi M, Zucchelli G, Ricciardi D, et al. Performance and clinical comparison between left ventricular quadripolar and bipolar leads in CRT: Observational research. *Indian Heart J*. 2018((Ziacchi M., matteo.ziacchi@gmail.com; Boriani G.; Biffi M.) Istituto di Cardiologia, Policlinico S. Orsola-Malpighi, Università di Bologna, Bologna, Italy)doi: 10.1016/j.ihj.2018.05.007.

Excluded Studies

1. . A double jolt for heart failure. *Harv Heart Lett*. 2002 May;12(9):5-6. – **No original data**
2. . Biventricular pacing for adults with AV block and heart failure. *BMJ*. 2013;346:f2719. – **No original data**
3. . Resynchronization therapy in patients with narrow QRS (RethinQ). *ACC Cardiosource Rev. J*. 2007;16(12):30. – **No original data**
4. Aarones M, Gullestad L, Aakhus S, et al. Prognostic value of cardiac troponin T in patients with moderate to severe heart failure scheduled for cardiac resynchronization therapy. *Am Heart J*. 2011 Jun;161(6):1031-7 - **Not relevant to Key Questions**
5. Abdelhamid MA, Ghanem MT, Abdelmotaleb AM. Assessment of right ventricular systolic function prior to cardiac resynchronization therapy: Does it make any difference? *Indian Heart J*. 2017 Nov - Dec;69(6):731-5. doi: 10.1016/j.ihj.2017.05.022. PMID: 29174250. - **Addresses only effectiveness, not an RCT**

6. Abdelrahman M, Subzposh FA, Beer D, et al. Clinical Outcomes of His Bundle Pacing Compared to Right Ventricular Pacing. *J Am Coll Cardiol.* 2018 May 22;71(20):2319-30. doi: 10.1016/j.jacc.2018.02.048. PMID: 29535066. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
7. Abreu A, Oliveira M, Silva Cunha P, et al. Does permanent atrial fibrillation modify response to cardiac resynchronization therapy in heart failure patients? *Rev Port Cardiol.* 2017 Oct;36(10):687-94. doi: 10.1016/j.repc.2017.02.016. PMID: 29031455. - **Does not address outcome of interest**
8. Abreu A, Oliveira M, Silva Cunha P, et al. Predictors of response to cardiac resynchronization therapy: A prospective cohort study. *Rev Port Cardiol.* 2017 Jun;36(6):417-25. doi: 10.1016/j.repc.2016.10.010. PMID: 28554585. - **Does not address outcome of interest**
9. Abreu A, Santa Clara H, Santos V, et al. High intensity interval training effects in patients with heart failure submitted to cardiac resynchronization therapy. *Eur Heart J.* 2015;36:461-2. doi: 10.1093/eurheartj/ehv399. PMID: CN-01473291. - **Does not address outcome of interest**
10. Abu Daya H, Alam MB, Adelstein E, et al. Echocardiography-guided left ventricular lead placement for cardiac resynchronization therapy in ischemic vs nonischemic cardiomyopathy patients. *Heart Rhythm.* 2014;11(4):614-9. doi: 10.1016/j.hrthm.2014.01.023. - **Other: prior review**
11. Abu Sham AR, Buber J, Grupper A, et al. Effects of tricuspid valve regurgitation on clinical and echocardiographic outcome in patients with cardiac resynchronization therapy. *Europace.* 2013;15(2):266-72. doi: 10.1093/europace/eus286. - **Addresses only effectiveness, not an RCT**
12. Abu Sham'a R, Buber J, Grupper A, et al. Effects of tricuspid valve regurgitation on clinical and echocardiographic outcome in patients with cardiac resynchronization therapy. *Europace.* 2013 2013 Feb;15(2):266-72 - **Not relevant to Key Questions**
13. Abu Sham'a R, Buber J, Grupper A, et al. Effects of tricuspid valve regurgitation on clinical and echocardiographic outcome in patients with cardiac resynchronization therapy. *Europace.* 2013 2013 Feb;15(2):266-72. - **Addresses only effectiveness, not an RCT**
14. Achilli A, Peraldo C, Sassara M, et al. Prediction of response to cardiac resynchronization therapy: the selection of candidates for CRT (SCART) study. *Pacing Clin Electrophysiol.* 2006 2006 Dec;29 Suppl 2:S11-9. - **Addresses only effectiveness, not an RCT**
15. Achilli A, Peraldo C, Sassara M, et al. Prediction of response to cardiac resynchronization therapy: the selection of candidates for CRT (SCART) study. *Pacing Clin Electrophysiol.* 2006 2006 Dec;29 Suppl 2:S11-9. - **Population inclusion criteria do not fall**

- within the QRS \geq 120ms and LVEF \leq 35% range**
16. Achilli A, Sassara M, Ficili S, et al. Long-term effectiveness of cardiac resynchronization therapy in patients with refractory heart failure and "narrow" QRS. *J Am Coll Cardiol.* 2003 2003 Dec 17;42(12):2117-24. - **Addresses only effectiveness, not an RCT**
 17. Achilli A, Sassara M, Ficili S, et al. Long-term effectiveness of cardiac resynchronization therapy in patients with refractory heart failure and "narrow" QRS. *J Am Coll Cardiol.* 2003 2003 Dec 17;42(12):2117-24. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
 18. Achilli A, Sassara M, Pontillo D, et al. Effectiveness of cardiac resynchronisation therapy in patients with echocardiographic evidence of mechanical dyssynchrony. *J Cardiovasc Med (Hagerstown).* 2008 2008 Feb;9(2):131-6. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
 19. Adamson PB, Kleckner KJ, VanHout WL, et al. Cardiac resynchronization therapy improves heart rate variability in patients with symptomatic heart failure. *Circulation.* 2003 2003 Jul 22;108(3):266-9 - **Not relevant to Key Questions**
 20. Adamson PB, Kleckner KJ, VanHout WL, et al. Cardiac resynchronization therapy improves heart rate variability in patients with symptomatic heart failure. *Circulation.* 2003 2003 Jul 22;108(3):266-9. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
 21. Adel Mohamed Elamragy A, Deyab RH, Rizk HH, et al. Effect of optimization of cardiac resynchronization therapy on short term outcomes using quickopt and tissue synchronization imaging. *Europace.* 2015;17:iii196. doi: 10.1093/europace/euv177. PMID: CN-01131347. – **Not full report**
 22. Adelstein E, Alam MB, Schwartzman D, et al. Effect of Echocardiography-Guided Left Ventricular Lead Placement for Cardiac Resynchronization Therapy on Mortality and Risk of Defibrillator Therapy for Ventricular Arrhythmias in Heart Failure Patients (from the Speckle Tracking Assisted Resynchronization Therapy for Electrode Region. *Am J Cardiol.* 2014 2014 Feb 13 - **Not relevant to Key Questions**
 23. Adelstein E, Schwartzman D, Bazaz R, et al. Outcomes in pacemaker-dependent patients upgraded from conventional pacemakers to cardiac resynchronization therapy-defibrillators. *Heart Rhythm.* 2014 Jun;11(6):1008-14. doi: 10.1016/j.hrthm.2014.03.024. PMID: 24657426 - **Not relevant to Key Questions**
 24. Adelstein E, Schwartzman D, Bazaz R, et al. Outcomes in pacemaker-dependent patients upgraded from conventional pacemakers to cardiac resynchronization therapy-defibrillators. *Heart Rhythm.* 2014 Jun;11(6):1008-14. doi:

- 10.1016/j.hrthm.2014.03.024.
PMID: 24657426. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
25. Adelstein E, Schwartzman D, Gorcsan Jr, et al. Predicting hyperresponse among pacemaker-dependent nonischemic cardiomyopathy patients upgraded to cardiac resynchronization. J Cardiovasc Electrophysiol. 2011 Aug;22(8):905-11 - **Not relevant to Key Questions**
 26. Adelstein EC, Alam MB, Schwartzman D, et al. Effect of echocardiography-guided left ventricular lead placement for cardiac resynchronization therapy on mortality and risk of defibrillator therapy for ventricular arrhythmias: results from speckle tracking assisted resynchronization therapy for electrode region (STARTER) trial. Journal of the american college of cardiology. 2014;63(12 SUPPL. 1):A269. doi: 10.1016/s0735-1097%2814%2960269-2. PMID: CN-01058798. – **Not full report**
 27. Adelstein EC, Althouse AD, Schwarzman D, et al. Scar burden, not intraventricular conduction delay pattern, is associated with outcomes in ischemic cardiomyopathy patients receiving cardiac resynchronization therapy. Heart Rhythm. 2018 May 28doi: 10.1016/j.hrthm.2018.05.027. PMID: 29852239. - **Addresses only effectiveness, not an RCT**
 28. Adelstein EC, Saba S. Burden of atrial fibrillation after cardiac resynchronization therapy. Am J Cardiol. 2007 2007 Jul 15;100(2):268-72. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
 29. Adelstein EC, Schwartzman D, Jain S, et al. Left ventricular dimensions predict risk of appropriate shocks but not mortality in cardiac resynchronization therapy-defibrillator recipients with left bundle-branch block and non-ischemic cardiomyopathy. Europace. 2017 Oct 1;19(10):1689-94. doi: 10.1093/europace/euw323. PMID: 27856539. - **Does not address outcome of interest**
 30. Adlbrecht C, Hulsmann M, Gwechenberger M, et al. Outcome after device implantation in chronic heart failure is dependent on concomitant medical treatment. Eur J Clin Invest. 2009 2009 Dec;39(12):1073-81. - **Addresses only effectiveness, not an RCT**
 31. Agacdiken A, Celikyurt U, Sahin T, et al. Neutrophil-to-lymphocyte ratio predicts response to cardiac resynchronization therapy. Med Sci Monit. 2013 2013;19:373-7 - **Not relevant to Key Questions**
 32. Agacdiken Agir A, Celikyurt U, Sahin T, et al. What is the lowest value of left ventricular baseline ejection fraction that predicts response to cardiac resynchronization therapy? Med Sci Monit. 2014 Sep 14;20:1641-6. doi: 10.12659/msm.891036. PMID: 25218410. - **Does not address outcome of interest**
 33. Agacdiken Agir A, Celikyurt U, Sahin T, et al. What is the lowest value of left ventricular baseline ejection fraction that predicts

- response to cardiac resynchronization therapy? Med Sci Monit. 2014 Sep 14;20:1641-6. doi: 10.12659/msm.891036. PMID: 25218410. - **Addresses only effectiveness, not an RCT**
34. Agha SA, Kalogeropoulos AP, Shih J, et al. Echocardiography and risk prediction in advanced heart failure: incremental value over clinical markers. J Card Fail. 2009 2009 Sep;15(7):586-92. – **Does not evaluate a CRT**
 35. Agha SA, Kalogeropoulos AP, Shih J, et al. Echocardiography and risk prediction in advanced heart failure: incremental value over clinical markers. J Card Fail. 2009 2009 Sep;15(7):586-92 - **Not relevant to Key Questions**
 36. Ahmed W, Samy W, Tayeh O, et al. Left ventricular scar impact on left ventricular synchronization parameters and outcomes of cardiac resynchronization therapy. Int J Cardiol. 2016 Nov 1;222:665-70. doi: 10.1016/j.ijcard.2016.07.158. PMID: 27517660. - **Does not address outcome of interest**
 37. Ahsan SY, Saberwal B, Lambiase PD, et al. An 8-year single-centre experience of cardiac resynchronisation therapy: procedural success, early and late complications, and left ventricular lead performance. Europace. 2013 2013 May;15(5):711-7. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
 38. Ahsan SY, Saberwal B, Lambiase PD, et al. An 8-year single-centre experience of cardiac resynchronisation therapy: procedural success, early and late complications, and left ventricular lead performance. Europace. 2013;15(5):711-7. doi: 10.1093/europace/eus401. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
 39. Ajaero CN, Chong CR, Procter NEK, et al. Does cardiac resynchronization therapy restore peripheral circulatory homeostasis? ESC Heart Fail. 2018;5(1):129-38. doi: 10.1002/ehf2.12211. - **Addresses effectiveness questions only and is not RCT**
 40. Ajaero CN, Ganesan A, Horowitz JD, et al. Electrical remodelling post cardiac resynchronization therapy in patients with ischemic and non-ischemic heart failure. J Electrocardiol. 2019;53((Ajaero C.N.) The Queen Elizabeth Hospital, 28 Woodville road, Woodville South, South Australia, Australia):44-51. doi: 10.1016/j.jelectrocard.2018.12.001. - **Addresses effectiveness questions only and is not RCT**
 41. Ajijola OA, Romero J, Vorobiof G, et al. Hyper-response to cardiac resynchronization with permanent His bundle pacing: Is parahisian pacing sufficient? HeartRhythm Case Rep. 2015;1(6):429-33. doi: 10.1016/j.hrcr.2015.05.006. – **Single case study**
 42. Ajijola OA, Upadhyay GA, Macias C, et al. Permanent His-bundle pacing for cardiac resynchronization therapy: Initial feasibility study in lieu of left ventricular lead. Heart Rhythm. 2017 Sep;14(9):1353-61. doi:

- 10.1016/j.hrthm.2017.04.003.
PMID: 28400315. - **Does not address outcome of interest**
43. Akar JG, Al-Chekakie MO, Fugate T, et al. Endothelial dysfunction in heart failure identifies responders to cardiac resynchronization therapy. *Heart Rhythm*. 2008 2008 Sep;5(9):1229-35. - **Other: not predictor of interest**
44. Akiyama M, Kaneko Y, Taniguchi Y, et al. Pacemaker syndrome associated with a biventricular pacing system. *J Cardiovasc Electrophysiol*. 2002 2002 Oct;13(10):1061-2. - **Single case study**
45. Akoudad S, Dabiri Abkenari L, Schaer BA, et al. Comparison of Multivariate Risk Estimation Models to Predict Prognosis in Patients With Implantable Cardioverter Defibrillators With or Without Cardiac Resynchronization Therapy. *Am J Cardiol*. 2017 May 1;119(9):1414-20. doi: 10.1016/j.amjcard.2017.01.035. PMID: 28267958. - **Does not address outcome of interest**
46. Aksoy H, Okutucu S, Aytemir K, et al. Baseline aortic pre-ejection interval predicts reverse remodeling and clinical improvement after cardiac resynchronization therapy. *Cardiol J*. 2011 2011;18(6):639-47 - **Not relevant to Key Questions**
47. Aksoy H, Okutucu S, Aytemir K, et al. Baseline aortic pre-ejection interval predicts reverse remodeling and clinical improvement after cardiac resynchronization therapy. *Cardiol J*. 2011 2011;18(6):639-47. - **Addresses only effectiveness, not an RCT**
48. Aksoy H, Okutucu S, Aytemir K, et al. Improvement in right ventricular systolic function after cardiac resynchronization therapy correlates with left ventricular reverse remodeling. *Pacing Clin Electrophysiol*. 2011 2011 Feb;34(2):200-7 - **Not relevant to Key Questions**
49. Aktas MK, Goldenberg I, Moss AJ, et al. Comparison of age (<75 Years versus >=75 Years) to risk of ventricular tachyarrhythmias and implantable cardioverter defibrillator shocks (from the Multicenter Automatic Defibrillator Implantation Trial With Cardiac Resynchronization Therapy). *Am J Cardiol*. 2014 Dec 15;114(12):1855-60. doi: 10.1016/j.amjcard.2014.09.026. PMID: 25438913. - **Does not address outcome of interest**
50. Aktas MK, Mittal S, Kutuyifa V, et al. The Burden and Morphology of Premature Ventricular Contractions and their Impact on Clinical Outcomes in Patients Receiving Biventricular Pacing in the Multicenter Automatic Defibrillator Implantation Trial-Cardiac Resynchronization Therapy (MADIT-CRT). *Ann Noninvasive Electrocardiol*. 2016 Jan;21(1):41-8. doi: 10.1111/anec.12268. PMID: 25683593. - **Does not address outcome of interest**
51. Aktas MK, Zareba W, Huang DT, et al. The Effect of Weight Loss on Clinical Outcomes in Patients Implanted With a Cardiac Resynchronization Therapy Device- A MADIT-CRT Substudy. *J Card Fail*. 2014 2014 Mar;20(3):183-9 - **Not relevant to Key Questions**

52. Aktas MK, Zareba W, Huang DT, et al. The Effect of Weight Loss on Clinical Outcomes in Patients Implanted With a Cardiac Resynchronization Therapy Device- A MADIT-CRT Substudy. *J Card Fail.* 2014 2014 Mar;20(3):183-9. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
53. Albertsen AE, Mortensen PT, Jensen HK, et al. Adverse effect of right ventricular pacing prevented by biventricular pacing during long-term follow-up: a randomized comparison. *Eur J Echocardiogr.* 2011 2011 Oct;12(10):767-72. - **Not relevant to Key Questions**
54. Albertsen AE, Mortensen PT, Jensen HK, et al. Adverse effect of right ventricular pacing prevented by biventricular pacing during long-term follow-up: a randomized comparison. *Eur J Echocardiogr.* 2011 2011 Oct;12(10):767-72. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
55. Albertsen AE, Nielsen JC, Pedersen AK, et al. Left ventricular lead performance in cardiac resynchronization therapy: impact of lead localization and complications. *Pacing Clin Electrophysiol.* 2005 2005 Jun;28(6):483-8. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
56. Albina G, Rivera S, Mondragón I, et al. Implant of cardiac resynchronization therapy device in patients with high percentage of right ventricular pacing and refractory heart failure. *Revista Argentina de Cardiologia.* 2017;85(5):440-3. doi: 10.7775/rac.v85.i5.10146. – **Not in English**
57. Al-Hijji MA, Killu AM, Yousefian O, et al. Outcomes of lead extraction without subsequent device reimplantation. *Europace.* 2017;19(9):1527-34. doi: 10.1093/europace/euw184. - **Does not address outcome of interest**
58. Al-Khatib SM, Hellkamp AS, Fonarow GC, et al. Association between prophylactic implantable cardioverter-defibrillators and survival in patients with left ventricular ejection fraction between 30% and 35%. *JAMA.* 2014 Jun 4;311(21):2209-15. doi: 10.1001/jama.2014.5310. PMID: 24893088. - **Does not evaluate a CRT**
59. Al-Khatib SM, Hellkamp AS, Fonarow GC, et al. Association between prophylactic implantable cardioverter-defibrillators and survival in patients with left ventricular ejection fraction between 30% and 35%. *JAMA.* 2014 Jun 4;311(21):2209-15. doi: 10.1001/jama.2014.5310. PMID: 24893088. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
60. Almeida-Morais L, Abreu A, Oliveira M, et al. Impact of cardiac resynchronization therapy on inflammatory biomarkers and cardiac remodeling: The paradox of functional and echocardiographic response. *Rev Port Cardiol.* 2018 Feb;37(2):105-13. doi: 10.1016/j.repc.2017.06.017. PMID:

29503051. - **Does not address outcome of interest**

61. Almenar L, Díaz B, Quesada A, et al. Cost-effectiveness analysis of cardiac resynchronization therapy in patients with NYHA I and NYHA II heart failure in Spain. *International Journal of Technology Assessment in Health Care*. 2013;29(2):140-6. doi: 10.1017/s0266462313000123. - **Does not address outcome of interest**
62. Alonso C, Leclercq C, Victor F, et al. Electrocardiographic predictive factors of long-term clinical improvement with multisite biventricular pacing in advanced heart failure. *Am J Cardiol*. 1999 Dec 15;84(12):1417-21. - **Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
63. Alonso C, Ritter P, Leclercq C, et al. Effects of cardiac resynchronization therapy on heart rate variability in patients with chronic systolic heart failure and intraventricular conduction delay. *Am J Cardiol*. 2003 May 1;91(9):1144-7. - **Not relevant to Key Questions**
64. Alonso C, Ritter P, Leclercq C, et al. Effects of cardiac resynchronization therapy on heart rate variability in patients with chronic systolic heart failure and intraventricular conduction delay. *Am J Cardiol*. 2003 May 1;91(9):1144-7. - **Population inclusion criteria do not fall**
65. Alpendurada F, Guha K, Sharma R, et al. Right ventricular dysfunction is a predictor of non-response and clinical outcome following cardiac resynchronization therapy. *J Cardiovasc Magn Reson*. 2011;13:68. - **Not relevant to Key Questions**
66. Alper AT, Akyol A, Hasdemir H, et al. Effect of cardiac resynchronization therapy on mean platelet volume. *Acta Cardiol*. 2008 Dec;63(6):735-9. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
67. Altman RK, McCarty D, Chen-Tournoux AA, et al. Usefulness of low-dose dobutamine echocardiography to predict response and outcome in patients undergoing cardiac resynchronization therapy. *Am J Cardiol*. 2011 Jul 15;108(2):252-7. - **Not relevant to Key Questions**
68. Alvarez-Alvarez B, García-Seara J, Martínez-Sande JL, et al. Cardiac resynchronization therapy outcomes in patients under nonoptimal medical therapy. *J Arrhythm*. 2018;34(5):548-55. doi: 10.1002/joa3.12101. PMID: 30327701. - **Does not address outcome of interest**
69. Alvarez-Alvarez B, Garcia-Seara J, Rodriguez-Manero M, et al. Prognostic value of nutrition status in the response of cardiac resynchronization therapy. *Indian Pacing Electrophysiol J*. 2018 Jul - Aug;18(4):133-9. doi:

- 10.1016/j.ipej.2018.04.001. PMID: 29649579. - **Addresses only effectiveness, not an RCT**
70. Aly MF, Kleijn SA, de Boer K, et al. Comparison of three-dimensional echocardiographic software packages for assessment of left ventricular mechanical dyssynchrony and prediction of response to cardiac resynchronization therapy. *Eur Heart J Cardiovasc Imaging*. 2013 Jul;14(7):700-10 - **Not relevant to Key Questions**
71. Aly MF, Kleijn SA, de Boer K, et al. Comparison of three-dimensional echocardiographic software packages for assessment of left ventricular mechanical dyssynchrony and prediction of response to cardiac resynchronization therapy. *Eur Heart J Cardiovasc Imaging*. 2013 Jul;14(7):700-10. - **Addresses only effectiveness, not an RCT**
72. Aly MFA, Kleijn SA, De Boer K, et al. Comparison of three-dimensional echocardiographic software packages for assessment of left ventricular mechanical dyssynchrony and prediction of response to cardiac resynchronization therapy. *Eur Heart J Cardiovasc Imaging*. 2013;14(7):700-10. doi: 10.1093/ehjci/jes218. - **Does not address outcome of interest**
73. Amit G, Suleiman M, Konstantino Y, et al. Sex differences in implantable cardioverter-defibrillator implantation indications and outcomes: lessons from the Nationwide Israeli-ICD Registry. *Europace*. 2014 Feb
- 19 - **Not relevant to Key Questions**
74. Ammann P, Kiencke S, Schaer B, et al. Cardiac resynchronization in severe heart failure and left bundle branch block: A single centre experience. *Swiss Med. Wkly*. 2004 2004;134(19-20):277-82 - **Not relevant to Key Questions**
75. Ammann P, Kiencke S, Schaer B, et al. Cardiac resynchronization in severe heart failure and left bundle branch block: a single center experience. *Swiss Med Wkly*. 2004 May 15;134(19-20):277-82. - **Addresses only effectiveness, not an RCT**
76. Ando K, Kanda S, Miura F, et al. Implant Characteristics of Quadripolar and Bipolar Left Ventricular Leads for Cardiac Resynchronization Therapy. *Int Heart J*. 2018 Sep 26;59(5):1002-7. doi: 10.1536/ihj.17-442. PMID: 30158380. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
77. Andre C, Piver E, Perault R, et al. Galectin-3 predicts response and outcomes after cardiac resynchronization therapy. *J Transl Med*. 2018 Nov 3;16(1):299. doi: 10.1186/s12967-018-1675-4. PMID: 30390680. - **Other: predictors**
78. Angheloiu GO, Saul M, Edelman K, et al. Predictors of left ventricular function deterioration in patients with left bundle branch block and ejection fraction $>$ 50%. *Congest Heart Fail*. 2013 Jul-Aug;19(4):E1-4. - **Does not evaluate a CRT**

79. Anna Soldatova AM, Kuznetsov VA, Krinochkin DV, et al. Super-response to cardiac resynchronisation therapy. *European journal of heart failure*. Conference: heart failure 2017 and the 4th world congress on acute heart failure. France. 2017;19:106. doi: 10.1002/ejhf.833. PMID: CN-01376809. - **Does not address outcome of interest**
80. Ansalone G, Giannantoni P, Ricci R, et al. Doppler myocardial imaging to evaluate the effectiveness of pacing sites in patients receiving biventricular pacing. *J Am Coll Cardiol*. 2002 2002 Feb 6;39(3):489-99 - **Not relevant to Key Questions**
81. Ansalone G, Giannantoni P, Ricci R, et al. Doppler myocardial imaging to evaluate the effectiveness of pacing sites in patients receiving biventricular pacing. *J Am Coll Cardiol*. 2002 2002 Feb 6;39(3):489-99. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
82. Ansalone G, Giannantoni P, Ricci R, et al. Doppler myocardial imaging in patients with heart failure receiving biventricular pacing treatment. *Am Heart J*. 2001 2001 Nov;142(5):881-96. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
83. Anselme F, Bordachar P, Pasquie JL, et al. Safety, feasibility, and outcome results of cardiac resynchronization with triple-site ventricular stimulation compared to conventional cardiac resynchronization. *Heart Rhythm*. 2016 Jan;13(1):183-9. doi: 10.1016/j.hrthm.2015.08.036. PMID: 26325531. - **Does not address outcome of interest**
84. Antonio N, Lourenco C, Teixeira R, et al. Cardiac resynchronization therapy is effective even in elderly patients with comorbidities. *J Interv Card Electrophysiol*. 2010 2010 Jan;27(1):61-8. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
85. Antonio N, Soares A, Carvalheiro T, et al. Circulating Endothelial Progenitor Cells as a Predictor of Response to Cardiac Resynchronization Therapy: The Missing Piece of the Puzzle? *Pacing Clin Electrophysiol*. 2014 2014 Jan 2 - **Not relevant to Key Questions**
86. António N, Soares A, Carvalheiro T, et al. Circulating endothelial progenitor cells as a predictor of response to cardiac resynchronization therapy: The missing piece of the puzzle? *PACE - Pacing and Clinical Electrophysiology*. 2014;37(6):731-9. doi: 10.1111/pace.12334. PMID: 24383551. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
87. Antonio N, Teixeira R, Coelho L, et al. Identification of 'super-responders' to cardiac resynchronization therapy: the importance of symptom duration and left ventricular geometry. *Europace*. 2009 2009 Mar;11(3):343-9 - **Not relevant to Key Questions**

88. Appert L, Menet A, Altes A, et al. Clinical Significance of Electromechanical Dyssynchrony and QRS Narrowing in Patients With Heart Failure Receiving Cardiac Resynchronization Therapy. *Canadian Journal of Cardiology*. 2019;35(1):27-34. doi: 10.1016/j.cjca.2018.10.019. - **Addresses effectiveness questions only and is not RCT**
89. Aranda JMJ, Woo GW, Conti JB, et al. Use of cardiac resynchronization therapy to optimize beta-blocker therapy in patients with heart failure and prolonged QRS duration. *Am J Cardiol*. 2005 2005 Apr 1;95(7):889-91. - **Addresses only effectiveness, not an RCT**
90. Aranda JMJ, Woo GW, Conti JB, et al. Use of cardiac resynchronization therapy to optimize beta-blocker therapy in patients with heart failure and prolonged QRS duration. *Am J Cardiol*. 2005 2005 Apr 1;95(7):889-91. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
91. Arao K, Fujiwara T, Sakakura K, et al. Hyponatremia as a predictor for worsening heart failure in patients receiving cardiac resynchronization therapy. *Circ J*. 2013 2013;77(1):116-22 - **Not relevant to Key Questions**
92. Arao K, Fujiwara T, Sakakura K, et al. Hyponatremia as a predictor for worsening heart failure in patients receiving cardiac resynchronization therapy. *Circulation Journal*. 2013;77(1):116-22. doi: 10.1253/circj.CJ-12-0672. - **Does not address outcome of interest**
93. Arao K, Fujiwara T, Sakakura K, et al. Hyponatremia as a predictor for worsening heart failure in patients receiving cardiac resynchronization therapy. *Circ J*. 2013 2013;77(1):116-22. - **Addresses only effectiveness, not an RCT**
94. Araujo EF, Chamlian EG, Peroni AP, et al. Cardiac resynchronization therapy in patients with chronic Chagas cardiomyopathy: long-term follow up. *Rev Bras Cir Cardiovasc*. 2014 Jan-Mar;29(1):31-6. PMID: 24896160. - **Does not address outcome of interest**
95. Arias MA, Pachon M, Puchol A, et al. Acute and mid-term outcomes of transvenous implant of a new left ventricular quadripolar lead versus bipolar leads for cardiac resynchronization therapy: results from a single-center prospective database. *Cardiol J*. 2012 2012;19(5):470-8 - **Not relevant to Key Questions**
96. Arias MA, Pachon M, Puchol A, et al. Acute and mid-term outcomes of transvenous implant of a new left ventricular quadripolar lead versus bipolar leads for cardiac resynchronization therapy: results from a single-center prospective database. *Cardiol J*. 2012 2012;19(5):470-8. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
97. Arnold AD, Shun-Shin MJ, Keene D, et al. His Resynchronization Versus Biventricular Pacing in Patients With Heart Failure and Left Bundle Branch Block. *J Am Coll Cardiol*. 2018;72(24):3112-22. doi:

- 10.1016/j.jacc.2018.09.073. -
Does not evaluate a CRT
98. Arrigo M, Truong QA, Szymonifka J, et al. Mid-regional pro-atrial natriuretic peptide to predict clinical course in heart failure patients undergoing cardiac resynchronization therapy. *Europace*. 2017 Nov 1;19(11):1848-54. doi: 10.1093/europace/euw305. PMID: 28096288. - **Does not address outcome of interest**
99. Arslan U, Balci MM, Kocaoglu I, et al. The effects of cardiac resynchronization treatment on autonomic functions aside from functional status in heart failure: Kardiyak resenkronizasyon tedavisinin otonom sistem uzerine fonksiyonel kapasite otesinde etkileri. *Anadolu Kardiyoloji Derg*. 2013 2013;13(5):439-45 - **Not relevant to Key Questions**
100. Arslan U, Balci MM, Kocaoglu I, et al. The effects of cardiac resynchronization treatment on autonomic functions aside from functional status in heart failure: Kardiyak resenkronizasyon tedavisinin otonom sistem uzerine fonksiyonel kapasite otesinde etkileri. *Anadolu Kardiyoloji Derg*. 2013 2013;13(5):439-45. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
101. Arslan U, Balci MM, Kocaoğlu I, et al. The effects of cardiac resynchronization treatment on autonomic functions aside from functional status in heart failure. *Anadolu Kardiyoloji Dergisi*. 2013;13(5):439-45. doi: 10.5152/akd.2013.138. - **Does not address outcome of interest**
102. Arya A, Haghjoo M, Dehghani MR, et al. Effect of cardiac resynchronization therapy on the incidence of ventricular arrhythmias in patients with an implantable cardioverter-defibrillator. *Heart Rhythm*. 2005 2005 Oct;2(10):1094-8 - **Not relevant to Key Questions**
103. Arzola-Castaner D, Taub C, Kevin Heist E, et al. Left ventricular lead proximity to an akinetic segment and impact on outcome of cardiac resynchronization therapy. *J Cardiovasc Electrophysiol*. 2006 2006 Jun;17(6):623-7. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
104. Asami M, Aoki J, Tanimoto S, et al. Effects of Long-Acting Loop Diuretics in Heart Failure With Reduced Ejection Fraction Patients With Cardiac Resynchronization Therapy. *Int Heart J*. 2017 Apr 6;58(2):211-9. doi: 10.1536/ihj.16-290. PMID: 28321027. - **Does not address outcome of interest**
105. Asbach S, Lennerz C, Semmler V, et al. Impact of the Right Ventricular Lead Position on Clinical End Points in CRT Recipients--A Subanalysis of the Multicenter Randomized SPICE Trial. *Pacing Clin Electrophysiol*. 2016 Mar;39(3):261-7. doi: 10.1111/pace.12793. PMID: 26643821. - **Does not address outcome of interest**
106. Ascoeta MS, Marijon E, Defaye P, et al. Impact of early complications on outcomes in patients with implantable cardioverter-defibrillator for primary prevention. *Heart Rhythm*. 2016

- May;13(5):1045-51. doi: 10.1016/j.hrthm.2015.12.046. PMID: 26749313. - **Does not evaluate a CRT**
107. Assadian Rad M, Tabarzan Baboli N, Barzigar A, et al. The role of the fragmented QRS complexes on a routine 12-lead ECG in predicting non-responsiveness to cardiac resynchronization therapy. *Anatol J Cardiol.* 2015 Mar;15(3):204-8. doi: 10.5152/akd.2014.5307. PMID: 25333982. - **Addresses only effectiveness, not an RCT**
108. Ates I, Yavuz AH, Doğru M, et al. Effects of ivabradine on 6-minute walk test and quality of life in patients with previously implanted CRT-D. *Journal of Investigative Medicine.* 2013;61(6):1013-7. doi: 10.231/JIM.0b013e31829614f0. - **Addresses only effectiveness, not an RCT**
109. Atherton G, McAloon CJ, Chohan B, et al. Safety and Cost-Effectiveness of Same-Day Cardiac Resynchronization Therapy and Implantable Cardioverter Defibrillator Implantation. *Am J Cardiol.* 2016 May 1;117(9):1488-93. doi: 10.1016/j.amjcard.2016.02.019. PMID: 26993428. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
110. Attanasio P, Lacour P, Ernert A, et al. Cardiac device implantations in obese patients: Success rates and complications. *Clin Cardiol.* 2017 Apr;40(4):230-4. doi: 10.1002/clc.22650. PMID: 28333397. - **Does not evaluate a CRT**
111. Atwater BD, Wagner GS, Kisslo J, et al. The electromechanical substrate for response to cardiac resynchronization therapy in patients with right bundle branch block. *Pacing Clin Electrophysiol.* 2017 Dec;40(12):1358-67. doi: 10.1111/pace.13231. PMID: 29086988. - **Does not address outcome of interest**
112. Auger D, Hoke U, Thijssen J, et al. Effect of cardiac resynchronization therapy on the sequence of mechanical activation assessed by two-dimensional radial strain imaging. *Am J Cardiol.* 2014 2014 Mar 15;113(6):982-7 - **Not relevant to Key Questions**
113. Auger DA, Bilchick KC, Gonzalez JA, et al. Imaging left-ventricular mechanical activation in heart failure patients using cine DENSE MRI: Validation and implications for cardiac resynchronization therapy. *J Magn Reson Imaging.* 2017 Sep;46(3):887-96. doi: 10.1002/jmri.25613. PMID: 28067978. - **Addresses only effectiveness, not an RCT**
114. Aune A, Faerstrand S, Hoff PI, et al. Atrioventricular nodal ablation in patients with resynchronization therapy and atrial fibrillation - long term results. *Scand Cardiovasc J.* 2017 Jun;51(3):138-42. doi: 10.1080/14017431.2017.1307443. PMID: 28345365. - **Does not address outcome of interest**
115. Auricchio A, Klein HU. Expansion of ICD indications: Resynchronization therapy and the ICD. *Card. Electrophysiol. Rev.* 2001 2001;5(1):35-40. - **No original data**

116. Auricchio A, Klein HU. Expansion of ICD indications: Resynchronization therapy and the ICD. *Card. Electrophysiol. Rev.* 2001 2001;5(1):35-40 - **Not relevant to Key Questions**
117. Auricchio A, Kloss M, Trautmann SI, et al. Exercise performance following cardiac resynchronization therapy in patients with heart failure and ventricular conduction delay. *Am J Cardiol.* 2002 2002 Jan 15;89(2):198-203 - **Not relevant to Key Questions**
118. Auricchio A, Kloss M, Trautmann SI, et al. Exercise performance following cardiac resynchronization therapy in patients with heart failure and ventricular conduction delay. *Am J Cardiol.* 2002 2002 Jan 15;89(2):198-203. - **Addresses only effectiveness, not an RCT**
119. Auricchio A, Salo RW. Acute hemodynamic improvement by pacing in patients with severe congestive heart failure. *Pacing Clin Electrophysiol.* 1997 1997 Feb;20(2 Pt 1):313-24. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
120. Austin CO, Landolfo K, Parikh PP, et al. Retained cardiac implantable electronic device fragments are not associated with magnetic resonance imaging safety issues, morbidity, or mortality after orthotopic heart transplant. *Am Heart J.* 2017 Aug;190:46-53. doi: 10.1016/j.ahj.2017.04.011. PMID: 28760213. - **Does not evaluate a CRT**
121. Azizian N, Rastgou F, Ghaedian T, et al. LV Dyssynchrony Assessed With Phase Analysis on Gated Myocardial Perfusion SPECT Can Predict Response to CRT in Patients With End-Stage Heart Failure. *Res Cardiovasc Med.* 2014 Nov;3(4):e20720. doi: 10.5812/cardiovascmed.20720. PMID: 25785250. - **Does not address outcome of interest**
122. Badhwar N, James J, Hoffmayer KS, et al. Utility of Equilibrium Radionuclide Angiogram-Derived Measures of Dyssynchrony to Predict Outcomes in Heart Failure Patients Undergoing Cardiac Resynchronization Therapy. *J Nucl Med.* 2016 Dec;57(12):1880-6. doi: 10.2967/jnumed.116.174789. PMID: 27417646. - **Does not address outcome of interest**
123. Badran HA, Abdelhamid MA, Ibrahim MT, et al. Left atrium in cardiac resynchronization therapy: Active participant or innocent bystander. *J Saudi Heart Assoc.* 2017 Oct;29(4):259-69. doi: 10.1016/j.jsha.2017.01.008. PMID: 28983169. - **Does not address outcome of interest**
124. Badran HA, Kamel JZ, Mohamed TR, et al. Using three-dimensional echocardiography to guide left ventricle lead position in cardiac resynchronization therapy: does it make any difference. *J Interv Card Electrophysiol.* 2017 Apr;48(3):299-306. doi: 10.1007/s10840-017-0229-7. PMID: 28194611. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
125. Bai R, Yang XY, Song Y, et al. Impact of left ventricular epicardial and biventricular pacing on

- ventricular repolarization in normal-heart individuals and patients with congestive heart failure. *Europace*. 2006 Nov;8(11):1002-10. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
126. Bajraktari G, Ronn F, Ibrahim P, et al. Combined electrical and global markers of dyssynchrony predict clinical response to cardiac resynchronization therapy. *Scand Cardiovasc J*. 2014 Oct;48(5):304-10. doi: 10.3109/14017431.2014.950601. PMID: 25117854. - **Addresses only effectiveness, not an RCT**
127. Bakker PF, Meijburg HW, de Vries JW, et al. Biventricular pacing in end-stage heart failure improves functional capacity and left ventricular function. *J Interv Card Electrophysiol*. 2000 Jun;4(2):395-404. - **Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
128. Bakos Z, Chatterjee NC, Reitan C, et al. Prediction of clinical outcome in patients treated with cardiac resynchronization therapy - the role of NT-ProBNP and a combined response score. *BMC Cardiovasc Disord*. 2018 Apr 24;18(1):70. doi: 10.1186/s12872-018-0802-8. PMID: 29699498. - **Addresses only effectiveness, not an RCT**
129. Bakos Z, Markstad H, Ostensfeld E, et al. Combined preoperative information using a bullseye plot from speckle tracking echocardiography, cardiac CT scan, and MRI scan: Targeted left ventricular lead implantation in patients receiving cardiac resynchronization therapy. *Eur Heart J Cardiovasc Imaging*. 2014;15(5):523-31. doi: 10.1093/ehjci/jet233. - **Does not address outcome of interest**
130. Bakos Z, Reitan C, Werther-Evaldsson A, et al. Cardiovascular drug utilization post-implant is related to clinical outcome in heart failure patients receiving cardiac resynchronization therapy. *Cardiol J*. 2017;24(4):374-84. doi: 10.5603/CJ.a2017.0019. PMID: 28198522. - **Does not address outcome of interest**
131. Balci KG, Balci MM, Sen F, et al. The role of baseline indirect inflammatory markers in prediction of response to cardiac resynchronisation therapy. *Kardiol Pol*. 2016;74(2):119-26. doi: 10.5603/KP.a2015.0142. PMID: 26202536. - **Does not address outcome of interest**
132. Balci MM, Balci KG, Sen F, et al. Usefulness of notched duration to predict response to cardiac resynchronization therapy. *Scand Cardiovasc J*. 2015 Aug;49(4):200-6. doi: 10.3109/14017431.2015.1026387. PMID: 25920477. - **Does not address outcome of interest**
133. Banavalikar B, Thajudeen A, Namboodiri N, et al. Long-term effects of cardiac resynchronization therapy on electrical remodeling in heart failure-A prospective study. *Pacing Clin Electrophysiol*. 2017 Nov;40(11):1279-85. doi: 10.1111/pace.13193. PMID:

28901586. - **Addresses only effectiveness, not an RCT**

134. Bani R, Checchi L, Cartei S, et al. Simplified Selvester Score: a practical electrocardiographic instrument to predict response to CRT. *J Electrocardiol.* 2015 Jan-Feb;48(1):62-8. doi: 10.1016/j.jelectrocard.2014.10.014. PMID: 25465866. - **Does not address outcome of interest**
135. Bank AJ, Burns KV, Gage RM, et al. Cardiac resynchronization therapy in the real world: comparison with the COMPANION study. *J Card Fail.* 2012 2012 Feb;18(2):153-8 - **Not relevant to Key Questions**
136. Bank AJ, Burns KV, Gage RM, et al. Cardiac resynchronization therapy in the real world: comparison with the COMPANION study. *J Card Fail.* 2012 2012 Feb;18(2):153-8. - **Addresses only effectiveness, not an RCT**
137. Bank AJ, Gage RM, Marek JJ, et al. Mechanical dyssynchrony is additive to ECG criteria and independently associated with reverse remodelling and clinical response to cardiac resynchronisation therapy in patients with advanced heart failure. *Open Heart.* 2015;2(1):e000246. doi: 10.1136/openhrt-2015-000246. PMID: 25973213. - **Addresses only effectiveness, not an RCT**
138. Bank AJ, Kaufman CL, Burns KV, et al. Intramural dyssynchrony and response to cardiac resynchronization therapy in patients with and without previous right ventricular pacing. *Eur J Heart Fail.* 2010 2010 Dec;12(12):1317-

24 - **Not relevant to Key Questions**

139. Bank AJ, Kaufman CL, Kelly AS, et al. Results of the Prospective Minnesota Study of ECHO/TDI in Cardiac Resynchronization Therapy (PROMISE-CRT) study. *J Card Fail.* 2009 2009 Jun;15(5):401-9 - **Not relevant to Key Questions**
140. Bank AJ, Rischall A, Gage RM, et al. Comparison of cardiac resynchronization therapy outcomes in patients with New York Heart Association functional class I/II versus III/IV heart failure. *J Card Fail.* 2012 2012 May;18(5):373-8. - **Addresses only effectiveness, not an RCT**
141. Bansch D, Bonnemeier H, Brandt J, et al. Shock efficacy and mortality of patients with single and dual coil electrodes: a subgroup analysis of the nordic ICD trial. *Europace.* Conference: world congress in cardiac electrophysiology and cardiac techniques 2016. France. 2016;18:i89. doi: 10.1093/europace/euw158. PMID: CN-01406358. - **Does not evaluate a CRT**
142. Barba-Pichardo R, Manovel Sánchez A, Fernández-Gómez JM, et al. Ventricular resynchronization therapy by direct His-bundle pacing using an internal cardioverter defibrillator. *Europace.* 2013;15(1):83-8. doi: 10.1093/europace/eus228. - **Does not address outcome of interest**
143. Barbhaiya C, Po JR, Hanon S, et al. Tpeak - Tend and Tpeak - Tend /QT ratio as markers of ventricular arrhythmia risk in cardiac resynchronization therapy patients.

- Pacing Clin Electrophysiol. 2013
2013 Jan;36(1):103-8 - **Not relevant to Key Questions**
144. Barbieri A, Bursi F, Bonatti S, et al. Evidence of reverse remodeling after long-term biventricular stimulation for resynchronization in patients with wide QRS selected on the basis of echocardiographic electromechanical delays. *Ital Heart J.* 2004 Nov;5(11):818-25.- **Other: <30 patients and not rct**
145. Barbieri F, Pfeifer B, Berger T, et al. Comparison of conventional resynchronization therapy to multipoint pacing using two separate left ventricular leads by non-invasive imaging of cardiac electrophysiology. *Eur Heart J.* 2015 Dec 7;36(46):3237. doi: 10.1093/eurheartj/ehv255. PMID: 26069214. – **Not full report**
146. Bardy GH, Lee KL, Mark DB, et al. Amiodarone or an implantable cardioverter-defibrillator for congestive heart failure. *N Engl J Med.* 2005 Jan 20;352(3):225-37. - **Does not evaluate a CRT**
147. Barra S, Boveda S, Providencia R, et al. Adding Defibrillation Therapy to Cardiac Resynchronization on the Basis of the Myocardial Substrate. *J Am Coll Cardiol.* 2017 Apr 4;69(13):1669-78. doi: 10.1016/j.jacc.2017.01.042. PMID: 28359511. - **Addresses only effectiveness, not an RCT**
148. Barra S, Duehmke R, Providencia R, et al. Patients upgraded to cardiac resynchronization therapy due to pacing-induced cardiomyopathy are at low risk of life-threatening ventricular arrhythmias: a long-term cause-of-
- death analysis. *Europace.* 2018 Jan 1;20(1):89-96. doi: 10.1093/europace/euw321. PMID: 28031276. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
149. Barra S, Duehmke R, Providência R, et al. Very long-term survival and late sudden cardiac death in cardiac resynchronization therapy patients. *Eur Heart J.* 2019((Barra S.) Cardiology Department, Hospital da Luz Arrabida, V. N. 4400-346 Gaia, Portugal)doi: 10.1093/eurheartj/ehz238. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
150. Barra S, Looi KL, Gajendragadkar PR, et al. Applicability of a risk score for prediction of the long-term benefit of the implantable cardioverter defibrillator in patients receiving cardiac resynchronization therapy. *Europace.* 2016 Aug;18(8):1187-93. doi: 10.1093/europace/euv352. PMID: 26566940. - **Does not address outcome of interest**
151. Barra S, Providencia R, Duehmke R, et al. Sex-specific outcomes with addition of defibrillation to resynchronisation therapy in patients with heart failure. *Heart.* 2017 May;103(10):753-60. doi: 10.1136/heartjnl-2016-310677. PMID: 28104669. - **Does not address outcome of interest**
152. Barra S, Yu E, Khan F, et al. An individualized left ventricular lead-targeting strategy improves long-term survival of cardiac resynchronization therapy patients and influences the benefit of the

- implantable cardioverter-defibrillator: a long-term follow-up of the TARGET study. *J Cardiovasc Med (Hagerstown)*. 2017;18(7):553-5. doi: 10.2459/jcm.0000000000000396. PMID: CN-01616290. – **No original data**
153. Barretto RBM, Piegas LS, Assef JE, et al. Mechanical dyssynchrony is similar in different patterns of left bundle-branch block: A dissincronia mecanica e semelhante em diferentes padroes do bloqueio de ramo esquerdo. *Arq. Bras. Cardiol*. 2013 2013;101(5):449-55. – **Not in English**
154. Barretto RBM, Piegas LS, Assef JE, et al. Mechanical dyssynchrony is similar in different patterns of left bundle-branch block: A dissincronia mecanica e semelhante em diferentes padroes do bloqueio de ramo esquerdo. *Arq. Bras. Cardiol*. 2013 2013;101(5):449-55 - **Not relevant to Key Questions**
155. Barsheshet A, Goldenberg I, Moss AJ, et al. Effect of elapsed time from coronary revascularization to implantation of a cardioverter defibrillator on long-term survival in the MADIT-II trial. *J Cardiovasc Electrophysiol*. 2011 2011 Nov;22(11):1237-42. - **Does not evaluate a CRT**
156. Bartko PE, Arfsten H, Heitzinger G, et al. Papillary Muscle Dyssynchrony-Mediated Functional Mitral Regurgitation: Mechanistic Insights and Modulation by Cardiac Resynchronization. *JACC Cardiovasc Imaging*. 2018 Aug 6doi: 10.1016/j.jcmg.2018.06.013. PMID: 30121264. - **Does not address outcome of interest**
157. Baturova MA, Kutuyifa V, McNitt S, et al. Usefulness of Electrocardiographic Left Atrial Abnormality to Predict Response to Cardiac Resynchronization Therapy in Patients With Mild Heart Failure and Left Bundle Branch Block (a Multicenter Automatic Defibrillator Implantation Trial with Cardiac Resynchronization Therapy Substudy). *Am J Cardiol*. 2018 Jul 15;122(2):268-74. doi: 10.1016/j.amjcard.2018.03.364. PMID: 29861050. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
158. Bax JJ, Delgado V, Sogaard P, et al. Prognostic implications of left ventricular global longitudinal strain in heart failure patients with narrow QRS complex treated with cardiac resynchronization therapy: a subanalysis of the randomized EchoCRT trial. *Eur Heart J*. 2017 Mar 7;38(10):720-6. doi: 10.1093/eurheartj/ehw506. PMID: 28426885. - **Does not address outcome of interest**
159. Beaudoin J, Singh JP, Szymonifka J, et al. Novel Heart Failure Biomarkers Predict Improvement of Mitral Regurgitation in Patients Receiving Cardiac Resynchronization Therapy-The BIOCRT Study. *Can J Cardiol*. 2016 Dec;32(12):1478-84. doi: 10.1016/j.cjca.2016.05.013. PMID: 27527259. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
160. Becker M, Erdmann N, Stegemann E, et al. Survival and quality of life in patients with cardiac

resynchronization therapy for severe heart failure and in heart transplant recipients within a contemporary heart failure management program. *J Heart Lung Transplant*. 2008 2008 Jul;27(7):746-52. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**

161. Becker M, Hoffmann R, Schmitz F, et al. Relation of optimal lead positioning as defined by three-dimensional echocardiography to long-term benefit of cardiac resynchronization. *Am J Cardiol*. 2007 2007 Dec 1;100(11):1671-6. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**

162. Becker M, Zwicker C, Kaminski M, et al. Dependency of cardiac resynchronization therapy on myocardial viability at the LV lead position. *JACC Cardiovasc Imaging*. 2011 2011 Apr;4(4):366-74 - **Not relevant to Key Questions**

163. Beela AS, Duchenne J, Petrescu A, et al. Sex-specific difference in outcome after cardiac resynchronization therapy. *Eur Heart J Cardiovasc Imaging*. 2019 Jan 15doi: 10.1093/ehjci/jez231. PMID: 30649246. - **Addresses effectiveness questions only and is not RCT**

164. Behaghel A, Brunet-Bernard A, Oger E, et al. Electrocardiographic correlates of mechanical dyssynchrony in recipients of cardiac resynchronization therapy devices. *Arch Cardiovasc Dis*. 2015 Dec;108(12):617-25. doi: 10.1016/j.acvd.2015.06.007. PMID:

26498536. - **Does not address outcome of interest**

165. Behar JM, Bostock J, Zhu Li AP, et al. Cardiac Resynchronization Therapy Delivered Via a Multipolar Left Ventricular Lead is Associated with Reduced Mortality and Elimination of Phrenic Nerve Stimulation: Long-Term Follow-Up from a Multicenter Registry. *J Cardiovasc Electrophysiol*. 2015 May;26(5):540-6. doi: 10.1111/jce.12625. PMID: 25631303. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**

166. Behar JM, Chin HM, Fearn S, et al. Cost-Effectiveness Analysis of Quadripolar Versus Bipolar Left Ventricular Leads for Cardiac Resynchronization Defibrillator Therapy in a Large, Multicenter UK Registry. *JACC Clin Electrophysiol*. 2017 Feb;3(2):107-16. doi: 10.1016/j.jacep.2016.04.009. PMID: 28280785. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**

167. Belperio J, Horwich T, Abraham WT, et al. Inflammatory Mediators and Clinical Outcome in Patients With Advanced Heart Failure Receiving Cardiac Resynchronization Therapy. *Am J Cardiol*. 2016 Feb 15;117(4):617-25. doi: 10.1016/j.amjcard.2015.11.049. PMID: 26832186. - **Addresses only effectiveness, not an RCT**

168. Benfatti RA, Manzano FM, Pontes JC, et al. Analysis of left ventricular function in patients with heart

- failure undergoing cardiac resynchronization. *Rev Bras Cir Cardiovasc.* 2013 2013 Mar;28(1):69-75. - **Other: LVEF not specified in patient inclusion**
169. Benz AP, Vamos M, Erath JW, et al. ICD lead type and RV lead position in CRT-D recipients. *Clinical Research in Cardiology.* 2018;107(12):1122-30. doi: 10.1007/s00392-018-1286-3. - **Addresses effectiveness questions only and is not RCT**
170. Berger T, Zwick RH, Stuehlinger M, et al. Impact of oxygen uptake efficiency slope as a marker of cardiorespiratory reserve on response to cardiac resynchronization therapy. *Clin Res Cardiol.* 2011 2011 Feb;100(2):159-66. - **Other: predictor <30 pts**
171. Bernard A, Donal E, Leclercq C, et al. Impact of Cardiac Resynchronization Therapy on Left Ventricular Mechanics: Understanding the Response through a New Quantitative Approach Based on Longitudinal Strain Integrals. *J Am Soc Echocardiogr.* 2015 Jun;28(6):700-8. doi: 10.1016/j.echo.2015.02.017. PMID: 25819341. - **Addresses only effectiveness, not an RCT**
172. Bernard A, Menet A, Marechaux S, et al. Predicting Clinical and Echocardiographic Response After Cardiac Resynchronization Therapy With a Score Combining Clinical, Electrocardiographic, and Echocardiographic Parameters. *Am J Cardiol.* 2017 Jun 1;119(11):1797-802. doi: 10.1016/j.amjcard.2017.02.046. PMID: 28400028. - **Does not address outcome of interest**
173. Bernheim A, Ammann P, Sticherling C, et al. Right atrial pacing impairs cardiac function during resynchronization therapy: acute effects of DDD pacing compared to VDD pacing. *J Am Coll Cardiol.* 2005 2005 May 3;45(9):1482-7. - **Addresses only effectiveness, not an RCT**
174. Bertaglia E, Migliore F, Baritussio A, et al. Stricter criteria for left bundle branch block diagnosis do not improve response to CRT. *Pacing Clin Electrophysiol.* 2017 Jul;40(7):850-6. doi: 10.1111/pace.13104. PMID: 28543265. - **Addresses only effectiveness, not an RCT**
175. Bertaglia E, Reggiani A, Palmisano P, et al. The stricter criteria for Class I CRT indication suggested by the 2016 ESC Guidelines reliably exclude patients with a worse prognosis in comparison with the 2013 ESC indication criteria. *Int J Cardiol.* 2018 Sep 8doi: 10.1016/j.ijcard.2018.09.027. PMID: 30217421. - **Addresses only effectiveness, not an RCT**
176. Bertini M, Delgado V, Nucifora G, et al. Effect of cardiac resynchronization therapy on subendo- and subepicardial left ventricular twist mechanics and relation to favorable outcome. *Am J Cardiol.* 2010 2010 Sep 1;106(5):682-7 - **Not relevant to Key Questions**
177. Bertini M, Mele D, Malagu M, et al. Cardiac resynchronization therapy guided by multimodality cardiac imaging. *Eur J Heart Fail.* 2016 Nov;18(11):1375-82. doi: 10.1002/ejhf.605. PMID: 27406979.

- Addresses only effectiveness, not an RCT**
178. Bertini M, Ziacchi M, Biffi M, et al. Effects of cardiac resynchronisation therapy on dilated cardiomyopathy with isolated ventricular non-compaction. *Heart*. 2011 2011 Feb;97(4):295-300 - **Not relevant to Key Questions**
179. Beshai JF, Truong Q. Resynchronization therapy in patients with narrow QRS (RethinQ). *ACC Cardiosource Rev. J*. 2008 2008;17(1):44. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
180. Best PJ, Hayes DL, Stanton MS. The potential usage of dual chamber pacing in patients with implantable cardioverter defibrillators. *Pacing Clin Electrophysiol*. 1999 1999 Jan;22(1 Pt 1):79-85 - **Not relevant to Key Questions**
181. Bhagwande R, Woo A, Ross J, et al. Septal ethanol ablation for hypertrophic obstructive cardiomyopathy: early and intermediate results of a Canadian referral centre. *Can J Cardiol*. 2003 2003 Jul;19(8):912-7. - **Does not evaluate a CRT**
182. Bhatt AG, Musat DL, Preminger MW, et al. Obstacles preventing biventricular pacing mitigated with lead extraction and His bundle pacing to achieve effective cardiac resynchronization. *HeartRhythm Case Rep*. 2017 Nov;3(11):531-5. doi: 10.1016/j.hrcr.2017.07.016. PMID: 29387545. – **Single case study**
183. Bhavnani SP, Pavuluri V, Coleman CI, et al. The gender-paradox among patients with implantable cardioverter-defibrillators: a propensity-matched study. *Pacing Clin Electrophysiol*. 2013 2013 Jul;36(7):878-84.-**Other: Compares CRT women to CRT men**
184. Biasucci LM, Bellocci F, Landolina M, et al. Risk stratification of ischaemic patients with implantable cardioverter defibrillators by C-reactive protein and a multi-markers strategy: results of the CAMI-GUIDE study. *Eur Heart J*. 2012 2012 Jun;33(11):1344-50. - **Does not evaluate a CRT**
185. Biasucci LM, Bellocci F, Landolina M, et al. Risk stratification of ischaemic patients with implantable cardioverter defibrillators by C-reactive protein and a multi-markers strategy: results of the CAMI-GUIDE study. *Eur Heart J*. 2012 2012 Jun;33(11):1344-50 - **Not relevant to Key Questions**
186. Biering-Sorensen T, Knappe D, Pouleur AC, et al. Regional Longitudinal Deformation Improves Prediction of Ventricular Tachyarrhythmias in Patients With Heart Failure With Reduced Ejection Fraction: A MADIT-CRT Substudy (Multicenter Automatic Defibrillator Implantation Trial-Cardiac Resynchronization Therapy). *Circ Cardiovasc Imaging*. 2017 Jan;10(1)doi: 10.1161/circimaging.116.005096. PMID: 28003221. - **Addresses only effectiveness, not an RCT**
187. Biffi M, Bertini M, Ziacchi M, et al. Left ventricular lead stabilization to retain cardiac resynchronization therapy at long term: when is it advisable? *Europace*. 2014

- Apr;16(4):533-40. doi:
10.1093/europace/eut300. PMID:
24072448. - **Does not address
outcome of interest**
188. Biffi M, Defaye P, Jais P, et al.
Benefits of left ventricular
endocardial pacing comparing
failed implants and prior non-
responders to conventional cardiac
resynchronization therapy: A
subanalysis from the ALSYNC
study. *Int J Cardiol.* 2018 May
15;259:88-93. doi:
10.1016/j.ijcard.2018.01.030.
PMID: 29579617. - **Population
inclusion criteria do not fall
within the QRS \geq 120ms and
LVEF \leq 35% range**
189. Bilchick KC, Kuruvilla S, Hamirani
YS, et al. Impact of mechanical
activation, scar, and electrical
timing on cardiac resynchronization
therapy response and clinical
outcomes. *J Am Coll Cardiol.* 2014
Apr 29;63(16):1657-66. doi:
10.1016/j.jacc.2014.02.533. PMID:
24583155 - **Not relevant to Key
Questions**
190. Bilchick KC, Kuruvilla S, Hamirani
YS, et al. Impact of mechanical
activation, scar, and electrical
timing on cardiac resynchronization
therapy response and clinical
outcomes. *J Am Coll Cardiol.* 2014
Apr 29;63(16):1657-66. doi:
10.1016/j.jacc.2014.02.533. PMID:
24583155. - **Does not address
outcome of interest**
191. Bilchick KC, Stukenborg GJ.
Comparative effectiveness of
cardiac resynchronization therapy in
combination with implantable
defibrillator in patients with heart
failure and wide QRS duration. *Am
J Cardiol.* 2014 Nov
15;114(10):1537-42. doi:
10.1016/j.amjcard.2014.08.017.
PMID: 25240510. - **Addresses only
effectiveness, not an RCT**
192. Binda C, Menet A, Appert L, et al.
Time course of secondary mitral
regurgitation in patients with heart
failure receiving cardiac
resynchronization therapy: Impact
on long-term outcome beyond left
ventricular reverse remodelling.
Arch Cardiovasc Dis. 2018
May;111(5):320-31. doi:
10.1016/j.acvd.2017.05.009. PMID:
29102366. - **Addresses only
effectiveness, not an RCT**
193. Birnie D, Lemke B, Aonuma K, et
al. Clinical outcomes with
synchronized left ventricular
pacing: Analysis of the adaptive
CRT trial. *Heart Rhythm.*
2013;10(9):1368-74. doi:
10.1016/j.hrthm.2013.07.007. -
Other: prior review
194. Birnie D, Ruddy T, Sapp J, et al.
Impact of baseline and change in
mechanical dyssynchrony on long-
term outcomes in the
resynchronization-defibrillation for
ambulatory heart failure trial (raft).
Canadian journal of cardiology.
2015;31(10 SUPPL. 1):S252-S3.
PMID: CN-01163056. – **Not full
report**
195. Birnie DH, Ha A, Higginson L, et
al. Impact of QRS Morphology and
Duration on Outcomes after Cardiac
Resynchronization Therapy Results
from the Resynchronization
Defibrillation for Ambulatory Heart
Failure Trial (RAFT). *Circulation:
Heart Failure.* 2013;6(6):1190-8.
doi:
10.1161/circheartfailure.113.00038
0. PMID: 23995437

196. Bisch L, Da Costa A, Dauphinot V, et al. Predictive factors of difficult implantation procedure in cardiac resynchronization therapy. *Europace*. 2010 2010 Aug;12(8):1141-8 - **Not relevant to Key Questions**
197. Biton Y, Costa J, Zareba W, et al. Predictors of Long-Term Mortality with Cardiac Resynchronization Therapy in Mild Heart Failure Patients with Left Bundle Branch Block. *Clin Cardiol*. 2018 Aug 23;doi: 10.1002/clc.23058. PMID: 30141210. - **Does not address outcome of interest**
198. Biton Y, Daimee UA, Baman JR, et al. Prognostic Importance of Defibrillator-Appropriate Shocks and Antitachycardia Pacing in Patients With Mild Heart Failure. *J Am Heart Assoc*. 2019;8(6)doi: 10.1161/jaha.118.010346. - **Addresses effectiveness questions only and is not RCT**
199. Biton Y, Goldenberg I, Kutiyafa V, et al. Relative Wall Thickness and the Risk for Ventricular Tachyarrhythmias in Patients With Left Ventricular Dysfunction. *J Am Coll Cardiol*. 2016 Jan 26;67(3):303-12. doi: 10.1016/j.jacc.2015.10.076. PMID: 26796396. -**Other: same patients included in the main study with 1820 subjects.**
200. Biton Y, Kutiyafa V, Zareba W, et al. Long-term outcome with cardiac resynchronization therapy in mild heart failure patients with left bundle branch block from US and Europe MADIT-CRT. *Heart Fail Rev*. 2015 Sep;20(5):535-43. doi: 10.1007/s10741-015-9499-2. PMID: 26216033. -**Other: same patients included in the main study with 1820 subjects.**
201. Biton Y, Moss AJ, Kutiyafa V, et al. Inverse Relationship of Blood Pressure to Long-Term Outcomes and Benefit of Cardiac Resynchronization Therapy in Patients With Mild Heart Failure: A Multicenter Automatic Defibrillator Implantation Trial With Cardiac Resynchronization Therapy Long-Term Follow-Up Substudy. *Circ Heart Fail*. 2015 Sep;8(5):921-6. doi: 10.1161/circheartfailure.115.002208. PMID: 26179186. -**Other: same patients included in the main study with 1820 subjects.**
202. Biton Y, Moss AJ, Kutiyafa V, et al. Inverse Relationship of Blood Pressure to Long-Term Outcomes and Benefit of Cardiac Resynchronization Therapy in Patients with Mild Heart Failure : A Multicenter Automatic Defibrillator Implantation Trial with Cardiac Resynchronization Therapy Long-Term Follow-Up Substudy. *Circulation: Heart Failure*. 2015;8(5):921-6. doi: 10.1161/circheartfailure.115.002208. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
203. Blaschke F, Knaus T, Celebi O, et al. Ventricular tachycardia or ventricular fibrillation occurs less often in patients with left bundle branch block and combined resynchronization and defibrillators than in patients with narrow QRS and conventional defibrillators. *Europace*. 2012 2012 Feb;14(2):224-9 - **Not relevant to Key Questions**

204. Blaschke F, Knaus T, Celebi O, et al. Ventricular tachycardia or ventricular fibrillation occurs less often in patients with left bundle branch block and combined resynchronization and defibrillators than in patients with narrow QRS and conventional defibrillators. *Europace*. 2012 2012 Feb;14(2):224-9. - **Addresses only effectiveness, not an RCT**
205. Bleeker GB, Bax JJ, Fung JW, et al. Clinical versus echocardiographic parameters to assess response to cardiac resynchronization therapy. *Am J Cardiol*. 2006 2006 Jan 15;97(2):260-3 - **Not relevant to Key Questions**
206. Bleeker GB, Schalij MJ, Holman ER, et al. Cardiac resynchronization therapy in patients with systolic left ventricular dysfunction and symptoms of mild heart failure secondary to ischemic or nonischemic cardiomyopathy. *Am J Cardiol*. 2006 2006 Jul 15;98(2):230-5 - **Not relevant to Key Questions**
207. Bleeker GB, Schalij MJ, Molhoek SG, et al. Frequency of left ventricular dyssynchrony in patients with heart failure and a narrow QRS complex. *Am J Cardiol*. 2005 2005 Jan 1;95(1):140-2. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
208. Bleeker GB, Schalij MJ, Molhoek SG, et al. Relationship between QRS duration and left ventricular dyssynchrony in patients with end-stage heart failure. *J Cardiovasc Electrophysiol*. 2004 2004 May;15(5):544-9. - **Does not evaluate a CRT**
209. Boczar K, Sławuta A, Ząbek A, et al. Cardiac resynchronization therapy with His bundle pacing. *PACE - Pacing and Clinical Electrophysiology*. 2019;42(3):374-80. doi: 10.1111/pace.13611. - **Addresses effectiveness questions only and is not RCT**
210. Boczar K, Ząbek A, Haberka K, et al. Venous stenosis and occlusion in the presence of endocardial leads. *Advances in Clinical and Experimental Medicine*. 2016;25(1):83-91. doi: 10.17219/acem/42317. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
211. Boehmer JP, Hariharan R, Devecchi FG, et al. A Multisensor Algorithm Predicts Heart Failure Events in Patients With Implanted Devices: Results From the MultiSENSE Study. *JACC Heart Fail*. 2017 Mar;5(3):216-25. doi: 10.1016/j.jchf.2016.12.011. PMID: 28254128. - **Does not address outcome of interest**
212. Bogaard MD, Hesselink T, Meine M, et al. The ECG in cardiac resynchronization therapy: influence of left and right ventricular preactivation and relation to acute response. *J Cardiovasc Electrophysiol*. 2012 2012 Nov;23(11):1237-45 - **Not relevant to Key Questions**
213. Bogale N, Witte K, Priori S, et al. The European Cardiac Resynchronization Therapy Survey: comparison of outcomes between de novo cardiac resynchronization therapy implantations and upgrades. *Eur J Heart Fail*. 2011 2011

Sep;13(9):974-83. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**

214. Bogdan S, Klempfner R, Sabbag A, et al. Functional response to cardiac resynchronization therapy in patients with renal dysfunction and subsequent long-term mortality. *J Cardiovasc Electrophysiol.* 2014 Nov;25(11):1188-95. doi: 10.1111/jce.12463. PMID: 24891182. - **Does not address outcome of interest**
215. Bogdan S, Klempfner R, Sabbag A, et al. Functional response to cardiac resynchronization therapy in patients with renal dysfunction and subsequent long-term mortality. *J Cardiovasc Electrophysiol.* 2014 Nov;25(11):1188-95. doi: 10.1111/jce.12463. PMID: 24891182. - **Addresses only effectiveness, not an RCT**
216. Bogdan S, Nof E, Eisen A, et al. Clinical Outcomes in Patients with Severe Renal Dysfunction Including Dialysis Following Defibrillator Implantation. *Am J Nephrol.* 2015;42(4):295-304. doi: 10.1159/000440772. PMID: 26529418. - **Does not evaluate a CRT**
217. Boidol J, Sredniawa B, Kowalski O, et al. Many response criteria are poor predictors of outcomes after cardiac resynchronization therapy: validation using data from the randomized trial. *Europace.* 2013 Jun;15(6):835-44 - **Not relevant to Key Questions**
218. Bojarczuk J, Josiak K, Kasztura M, et al. Iron deficiency in heart failure: Impact on response to cardiac resynchronization therapy. *Int J Cardiol.* 2016;222:133-4. doi: 10.1016/j.ijcard.2016.07.280. PMID: 27494725
219. Bomma C, Dalal D, Tandri H, et al. Regional differences in systolic and diastolic function in arrhythmogenic right ventricular dysplasia/cardiomyopathy using magnetic resonance imaging. *Am J Cardiol.* 2005 2005 Jun 15;95(12):1507-11. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
220. Bonakdar HR, Jorat MV, Fazelifar AF, et al. Prediction of response to cardiac resynchronization therapy using simple electrocardiographic and echocardiographic tools. *Europace.* 2009 2009 Oct;11(10):1330-7. - **Addresses only effectiveness, not an RCT**
221. Bonanno C, Ometto R, Pasinato S, et al. Effects of cardiac resynchronization therapy on disease progression in patients with congestive heart failure. *Ital Heart J.* 2004 2004 May;5(5):364-70. - **Addresses only effectiveness, not an RCT**
222. Bonhorst D, Guerreiro S, Fonseca C, et al. Real-life data on heart failure before and after implantation of resynchronization and/or defibrillation devices - the Sincrone study. *Rev Port Cardiol.* 2019 Jan;38(1):33-41. doi: 10.1016/j.repc.2018.04.011. Epub 2019 Jan 23. PMID: 30685295. - **Not in English**
223. Bonnemeier H, Anna S, Angelika F, et al. Incidence of shock therapies in patients implanted with CRTD

- versus ICD: a nordic ICD substudy. Circulation. Conference: resuscitation science symposium, res 2017. United states. 2017;136(Supplement 1) (no pagination) PMID: CN-01438596. – **Not full report**
224. Bordachar P, Gras D, Babuty D, et al. Clinical impact of adding a second left ventricular lead in CRT non responders: the V3 trial. Heart rhythm. 2014;11(5 SUPPL. 1):S40. doi: 10.1016/j.hrthm.2014.03.025. PMID: CN-01060591. – **Not full report**
225. Bordachar P, Gras D, Babuty D, et al. Long-term outcomes of triple-site ventricular stimulation in non-responders to cardiac resynchronization therapy. Heart rhythm. 2015;12(5 SUPPL. 1):S88-S9. PMID: CN-01089010. – **Not full report**
226. Bordachar P, Gras D, Clementy N, et al. Clinical impact of an additional left ventricular lead in cardiac resynchronization therapy nonresponders: The V(3) trial. Heart Rhythm. 2018 Jun;15(6):870-6. doi: 10.1016/j.hrthm.2017.12.028. PMID: 29288035. - **Does not address outcome of interest**
227. Bordachar P, Lafitte S, Reuter S, et al. Biventricular pacing and left ventricular pacing in heart failure: similar hemodynamic improvement despite marked electromechanical differences. J Cardiovasc Electrophysiol. 2004 2004 Dec;15(12):1342-7. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
228. Bordachar P, Lafitte S, Reuter S, et al. Echocardiographic parameters of ventricular dyssynchrony validation in patients with heart failure using sequential biventricular pacing. J Am Coll Cardiol. 2004 2004 Dec 7;44(11):2157-65 - **Not relevant to Key Questions**
229. Bordachar P, Lafitte S, Reuter S, et al. Echocardiographic parameters of ventricular dyssynchrony validation in patients with heart failure using sequential biventricular pacing. J Am Coll Cardiol. 2004 2004 Dec 7;44(11):2157-65. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
230. Boriani G, Berti E, Belotti LM, et al. Cardiac device therapy in patients with left ventricular dysfunction and heart failure: 'real-world' data on long-term outcomes (mortality, hospitalizations, days alive and out of hospital). Eur J Heart Fail. 2016 Jun;18(6):693-702. doi: 10.1002/ejhf.509. PMID: 27060289. - **Does not address outcome of interest**
231. Boriani G, Biffi M, Martignani C, et al. Electrocardiographic remodeling during cardiac resynchronization therapy. Int J Cardiol. 2006 2006 Apr 4;108(2):165-70. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
232. Boriani G, Da Costa A, Quesada A, et al. Effects of remote monitoring on clinical outcomes and use of healthcare resources in heart failure patients with biventricular defibrillators: results of the MORE-CARE multicentre randomized controlled trial. Eur J Heart Fail.

- 2017 Mar;19(3):416-25. doi: 10.1002/ejhf.626. PMID: 27568392. - **Does not address outcome of interest**
233. Boriani G, Fallani F, Martignani C, et al. Cardiac resynchronization therapy: effects on left and right ventricular ejection fraction during exercise. *Pacing Clin Electrophysiol.* 2005 2005 Jan;28 Suppl 1:S11-4. - **Addresses only effectiveness, not an RCT**
234. Boriani G, Gasparini M, Landolina M, et al. Impact of mitral regurgitation on the outcome of patients treated with CRT-D: data from the InSync ICD Italian Registry. *Pacing Clin Electrophysiol.* 2012 2012 Feb;35(2):146-54 - **Not relevant to Key Questions**
235. Boriani G, Gasparini M, Landolina M, et al. Incidence and clinical relevance of uncontrolled ventricular rate during atrial fibrillation in heart failure patients treated with cardiac resynchronization therapy. *Eur J Heart Fail.* 2011 2011 Aug;13(8):868-76 - **Not relevant to Key Questions**
236. Boriani G, Gasparini M, Lunati M, et al. Characteristics of ventricular tachyarrhythmias occurring in ischemic versus nonischemic patients implanted with a biventricular cardioverter-defibrillator for primary or secondary prevention of sudden death. *Am Heart J.* 2006 2006 Sep;152(3):527.e1-11. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
237. Boriani G, Rapezzi C, Diemberger I, et al. Trial-generated profiles for implantation of electrical devices in outpatients with heart failure: real-world prevalence and 1-year outcome. *J Eval Clin Pract.* 2010 2010 Feb;16(1):82-91 - **Not relevant to Key Questions**
238. Boriani G, Rapezzi C, Diemberger I, et al. Trial-generated profiles for implantation of electrical devices in outpatients with heart failure: real-world prevalence and 1-year outcome. *J Eval Clin Pract.* 2010 2010 Feb;16(1):82-91. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
239. Borleffs CJ, Ypenburg C, van Bommel RJ, et al. Clinical importance of new-onset atrial fibrillation after cardiac resynchronization therapy. *Heart Rhythm.* 2009 2009 Mar;6(3):305-10 - **Not relevant to Key Questions**
240. Borne RT, Peterson PN, Greenlee R, et al. Temporal trends in patient characteristics and outcomes among Medicare beneficiaries undergoing primary prevention implantable cardioverter-defibrillator placement in the United States, 2006-2010. Results from the National Cardiovascular Data Registry's Implantable Cardioverter-Defibrillator Registry. *Circulation.* 2014 Sep 2;130(10):845-53. doi: 10.1161/circulationaha.114.008653. PMID: 25095884. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
241. Boros AM, Perge P, Jenei Z, et al. Measurement of the Red Blood Cell

- Distribution Width Improves the Risk Prediction in Cardiac Resynchronization Therapy. *Dis Markers*. 2016;2016:7304538. doi: 10.1155/2016/7304538. PMID: 26903690. - **Does not address outcome of interest**
242. Boros AM, Szeplaki G, Perge P, et al. The ratio of the neutrophil leucocytes to the lymphocytes predicts the outcome after cardiac resynchronization therapy. *Europace*. 2016 May;18(5):747-54. doi: 10.1093/europace/euv100. PMID: 25972301. - **Does not address outcome of interest**
243. Bortnik M, Degiovanni A, Dell'era G, et al. Prevalence of ventricular arrhythmias in patients with cardiac resynchronization therapy without back-up ICD: a single-center experience. *J Cardiovasc Med (Hagerstown)*. 2013 2013 Jun 27 - **Not relevant to Key Questions**
244. Bortnik M, Degiovanni A, Dell'era G, et al. Prevalence of ventricular arrhythmias in patients with cardiac resynchronization therapy without back-up ICD: A single-center experience. *Journal of Cardiovascular Medicine*. 2014;15(4):301-6. doi: 10.2459/JCM.0b013e3283638148. PMID: 23811840. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
245. Bose A, Kandala J, Upadhyay GA, et al. Impact of Myocardial Viability and Left Ventricular Lead Location on Clinical Outcome in Cardiac Resynchronization Therapy Recipients with Ischemic Cardiomyopathy. *J Cardiovasc Electrophysiol*. 2013 2013 Dec 18 - **Not relevant to Key Questions**
246. Bose A, Kandala J, Upadhyay GA, et al. Impact of myocardial viability and left ventricular lead location on clinical outcome in cardiac resynchronization therapy recipients with ischemic cardiomyopathy. *J Cardiovasc Electrophysiol*. 2014;25(5):507-13. doi: 10.1111/jce.12348. PMID: 24350650. - **Addresses only effectiveness, not an RCT**
247. Bose A, Upadhyay GA, Kandala J, et al. Does prior valve surgery change outcome in patients treated with cardiac resynchronization therapy? *J Cardiovasc Electrophysiol*. 2014 Nov;25(11):1206-13. doi: 10.1111/jce.12469. PMID: 24903306. - **Addresses only effectiveness, not an RCT**
248. Bossard M, Sticherling C, Kühne M, et al. Outcome of patients with cardiac resynchronisation defibrillator therapy and a follow-up of at least five years after implant. *Swiss Med Wkly*. 2014;144((Bossard M., matthias.bossard@usb.ch; Sticherling C.; Kühne M.; Frey S.; Osswald S.; Schaer B.) Department of Cardiology, University Hospital, Petersgraben 4, CH-4031 Basel, Switzerland)doi: 10.4414/smw.2014.13938. -**Other: prior review**
249. Botto GL, Padeletti L, Covino G, et al. Electrical treatment of atrial arrhythmias in heart failure patients implanted with a dual defibrillator CRT device. Results from the TRADE-HF study. *Int J Cardiol*. 2017 Jun 1;236:181-6. doi:

- 10.1016/j.ijcard.2017.01.101.
PMID: 28131706. - **Does not address outcome of interest**
250. Botto GL, Ricci RP, Bénézet JM, et al. Managed ventricular pacing compared with conventional dual-chamber pacing for elective replacement in chronically paced patients: Results of the Prefer for Elective Replacement Managed Ventricular Pacing randomized study. *Heart Rhythm*. 2014;11(6):992-1000. doi: 10.1016/j.hrthm.2014.01.011. PMID: 24418164. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
251. Boven NV, Bogaard K, Ruiter J, et al. Functional response to cardiac resynchronization therapy is associated with improved clinical outcome and absence of appropriate shocks. *J Cardiovasc Electrophysiol*. 2013;24(3):316-22. doi: 10.1111/jce.12037. PMID: 23210664. -**Other: prior review**
252. Boven NV, Theuns D, Bogaard K, et al. Atrial Fibrillation in Cardiac Resynchronization Therapy with a Defibrillator: A Risk Factor for Mortality, Appropriate and Inappropriate Shocks. *J Cardiovasc Electrophysiol*. 2013doi: 10.1111/jce.12208. PMID: 23889733. - **Does not evaluate a CRT**
253. Brachmann J, Brugada J, Singh J, et al. Weekly SonR optimization is associated with significantly reduced risk in all-cause death and/or heart failure hospitalization in CRT-D patients with LBBB QRS $<$ 150ms. *Europace*. Conference: european heart rhythm association EUROPACE-CARDIOSTIM 2017 congress. Austria. 2017;19(Supplement 3):iii214-iii5. PMID: CN-01421501. – **Not full report**
254. Brandt RR, Reiner C, Arnold R, et al. Contractile response and mitral regurgitation after temporary interruption of long-term cardiac resynchronization therapy. *Eur Heart J*. 2006 2006 Jan;27(2):187-92 - **Not relevant to Key Questions**
255. Braunschweig F, Linde C, Benson L, et al. New York Heart Association functional class, QRS duration, and survival in heart failure with reduced ejection fraction: implications for cardiac resynchronization therapy. *Eur J Heart Fail*. 2017 Mar;19(3):366-76. doi: 10.1002/ejhf.563. PMID: 27338764. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
256. Braunschweig F, Linde C, Gadler F, et al. Reduction of hospital days by biventricular pacing. *Eur J Heart Fail*. 2000 2000 Dec;2(4):399-406. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
257. Braunschweig F, Mortensen PT, Gras D, et al. Monitoring of physical activity and heart rate variability in patients with chronic heart failure using cardiac resynchronization devices. *Am J Cardiol*. 2005 2005 May 1;95(9):1104-7. - **Addresses only effectiveness, not an RCT**
258. Breithardt G. MADIT-CRT (Multicenter Automatic

- Defibrillator Implantation Trial-Cardiac Resynchronization Therapy): cardiac resynchronization therapy towards early management of heart failure. *Eur Heart J*. 2009 Nov;30(21):2551-3. – **No original data**
259. Breithardt OA, Kuhl HP, Stellbrink C. Acute effects of resynchronisation treatment on functional mitral regurgitation in dilated cardiomyopathy. *Heart*. 2002 Oct;88(4):440. – **Single case study**
260. Breithardt OA, Sinha AM, Schwammenthal E, et al. Acute effects of cardiac resynchronization therapy on functional mitral regurgitation in advanced systolic heart failure. *J Am Coll Cardiol*. 2003 Mar 5;41(5):765-70 - **Not relevant to Key Questions**
261. Breithardt OA, Stellbrink C, Franke A, et al. Acute effects of cardiac resynchronization therapy on left ventricular Doppler indices in patients with congestive heart failure. *Am Heart J*. 2002 Jan;143(1):34-44 - **Not relevant to Key Questions**
262. Breithardt OA, Stellbrink C, Kramer AP, et al. Echocardiographic quantification of left ventricular asynchrony predicts an acute hemodynamic benefit of cardiac resynchronization therapy. *J Am Coll Cardiol*. 2002 Aug 7;40(3):536-45 - **Not relevant to Key Questions**
263. Bremont C, Lim P, Elbaz N, et al. Cardiac Resynchronization Therapy Plus Coupled Pacing Improves Acutely Myocardial Function in Heart Failure Patients. *Pacing Clin Electrophysiol*. 2014 Jan 27. - **Addresses only effectiveness, not an RCT**
264. Brémont C, Lim P, Elbaz N, et al. Cardiac resynchronization therapy plus coupled pacing improves acutely myocardial function in heart failure patients. *PACE - Pacing and Clinical Electrophysiology*. 2014;37(7):803-9. doi: 10.1111/pace.12348. PMID: 24467552 -**Other: prior review**
265. Brenyo A, Barsheshet A, Kutiyafa V, et al. Predictors of spontaneous reverse remodeling in mild heart failure patients with left ventricular dysfunction. *Circ Heart Fail*. 2014 Jul;7(4):565-72. doi: 10.1161/circheartfailure.113.000929. PMID: 24786217. -**Other: prior review**
266. Brenyo A, Rao M, Barsheshet A, et al. QRS axis and the benefit of cardiac resynchronization therapy in patients with mildly symptomatic heart failure enrolled in MADIT-CRT. *J Cardiovasc Electrophysiol*. 2013 Apr;24(4):442-8 - **Not relevant to Key Questions**
267. Brouwers C, Versteeg H, Meine M, et al. Association between brain natriuretic peptide, markers of inflammation and the objective and subjective response to cardiac resynchronization therapy. *Brain Behav Immun*. 2014 Aug;40:211-8. doi: 10.1016/j.bbi.2014.03.017. PMID: 24704567 - **Not relevant to Key Questions**
268. Brouwers C, Versteeg H, Meine M, et al. Association between brain natriuretic peptide, markers of inflammation and the objective and subjective response to cardiac

- resynchronization therapy. *Brain Behav Immun.* 2014 Aug;40:211-8. doi: 10.1016/j.bbi.2014.03.017. PMID: 24704567. - **Does not address outcome of interest**
269. Brown JR, Alonso A, Warman EN, et al. Long-term impact of intrathoracic impedance findings on survival and heart failure hospitalizations after cardiac resynchronization therapy in ICD Registry patients. *Europace.* 2018 Jul 1;20(7):1138-45. doi: 10.1093/europace/eux197. PMID: 29016777. - **Does not address outcome of interest**
270. Brugada J, Delnoy PP, Brachmann J, et al. Contractility sensor-guided optimization of cardiac resynchronization therapy: results from the RESPOND-CRT trial. *Eur Heart J.* 2017 Mar 7;38(10):730-8. doi: 10.1093/eurheartj/ehw526. PMID: 27941020. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
271. Brunet-Bernard A, Marechaux S, Fauchier L, et al. Combined score using clinical, electrocardiographic, and echocardiographic parameters to predict left ventricular remodeling in patients having had cardiac resynchronization therapy six months earlier. *Am J Cardiol.* 2014 Jun 15;113(12):2045-51. doi: 10.1016/j.amjcard.2014.03.050. PMID: 24793667 - **Not relevant to Key Questions**
272. Brunet-Bernard A, Marechaux S, Fauchier L, et al. Combined score using clinical, electrocardiographic, and echocardiographic parameters to predict left ventricular remodeling in patients having had cardiac resynchronization therapy six months earlier. *Am J Cardiol.* 2014 Jun 15;113(12):2045-51. doi: 10.1016/j.amjcard.2014.03.050. PMID: 24793667. - **Does not address outcome of interest**
273. Brusich S, Zeljković I, Pavlovic N, et al. Croatian National Data and Comparison with European Practice: Data from the Cardiac Resynchronization Therapy Survey II Multicenter Registry. *Cardiol Res Pract.* 2018;2018((Brusich S., sandro.brusich@gmail.com; Židan D., david.zidan@gmail.com; Klasan M., kanarinac193@gmail.com; Čubranić Z., zcubrani@gmail.com) Rijeka University Hospital Centre, Rijeka, Croatia)doi: 10.1155/2018/3479846. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
274. Brzezinska B, Loboz-Grudzien K, Wita K, et al. Predictors of functional mitral regurgitation improvement during a short-term follow-up after cardiac resynchronisation therapy. *Kardiol Pol.* 2016;74(7):665-73. doi: 10.5603/KP.a2016.0005. PMID: 26779854. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
275. Buch E, Lellouche N, De Diego C, et al. Left ventricular apical wall motion abnormality is associated with lack of response to cardiac resynchronization therapy in patients with ischemic cardiomyopathy. *Heart Rhythm.*

- 2007 2007 Oct;4(10):1300-5 - **Not relevant to Key Questions**
276. Buchta P, Tajstra M, Kurek A, et al. The impact of remote monitoring of implanted cardioverter-defibrillator (ICD) and cardiac resynchronization therapy device (CRT-D) patients on healthcare costs in the Silesian population: three-year follow-up. *Kardiol Pol.* 2017;75(6):573-80. doi: 10.5603/KP.a2017.0019. PMID: 28150288. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
277. Buck S, Maass AH, Nieuwland W, et al. Impact of interventricular lead distance and the decrease in septal-to-lateral delay on response to cardiac resynchronization therapy. *Europace.* 2008 2008 Nov;10(11):1313-9. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
278. Bulur S, Vural A, Yazici M, et al. Incidence and predictors of subclavian vein obstruction following biventricular device implantation. *J. Intervent. Card. Electrophysiol.* 2010 2010;29(3):199-202. - **Other: not our outcome**
279. Bundgaard JS, Thune JJ, Nielsen JC, et al. The impact of implantable cardioverter-defibrillator implantation on health-related quality of life in the DANISH trial. *Europace.* 2019 Feb 22doi: 10.1093/europace/euz018. PMID: 30796456. - **Does not evaluate a CRT**
280. Burns KV, Gage RM, Curtin AE, et al. Left ventricular-only pacing in heart failure patients with normal atrioventricular conduction improves global function and left ventricular regional mechanics compared with biventricular pacing: an adaptive cardiac resynchronization therapy sub-study. *Eur J Heart Fail.* 2017 Oct;19(10):1335-43. doi: 10.1002/ejhf.906. PMID: 28653458. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
281. Burns KV, Gage RM, Curtin AE, et al. Long-Term Echocardiographic Response to Cardiac Resynchronization Therapy in Initial Nonresponders. *JACC Heart Fail.* 2015 Dec;3(12):990-7. doi: 10.1016/j.jchf.2015.09.006. PMID: 26577619. - **Does not address outcome of interest**
282. Burri H, da Costa A, Quesada A, et al. Risk stratification of cardiovascular and heart failure hospitalizations using integrated device diagnostics in patients with a cardiac resynchronization therapy defibrillator. *Europace.* 2018 May 1;20(5):e69-e77. doi: 10.1093/europace/eux206. PMID: 28679168. - **Does not address outcome of interest**
283. Burri H, Domenichini G, Sunthorn H, et al. Right ventricular systolic function and cardiac resynchronization therapy. *Europace.* 2010 2010 Mar;12(3):389-94 - **Not relevant to Key Questions**
284. Burri H, Sunthorn H, Somsen A, et al. Improvement in cardiac sympathetic nerve activity in

- responders to resynchronization therapy. *Europace*. 2008 2008 Mar;10(3):374-8. **-Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
285. Burri H, Sunthorn H, Somsen A, et al. Optimizing sequential biventricular pacing using radionuclide ventriculography. *Heart Rhythm*. 2005 2005 Sep;2(9):960-5 - **Not relevant to Key Questions**
286. Butter C, Auricchio A, Stellbrink C, et al. Effect of resynchronization therapy stimulation site on the systolic function of heart failure patients. *Circulation*. 2001 2001 Dec 18;104(25):3026-9 - **Not relevant to Key Questions**
287. Butter C, Auricchio A, Stellbrink C, et al. Effect of resynchronization therapy stimulation site on the systolic function of heart failure patients. *Circulation*. 2001 2001 Dec 18;104(25):3026-9. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
288. Cabrera-Bueno F, Fernandez-Pastor J, Molina-Mora MJ, et al. Combined resynchronization therapy and automatic defibrillator in advanced non-ischaemic heart failure: the importance of QRS width. *Europace*. 2010 2010 Jan;12(1):92-5 - **Not relevant to Key Questions**
289. Cabrera-Bueno F, Garcia-Pinilla JM, Pena-Hernandez J, et al. Repercussion of functional mitral regurgitation on reverse remodelling in cardiac resynchronization therapy. *Europace*. 2007 2007 Sep;9(9):757-61. **-Other: <30 patients**
290. Cabrera-Bueno F, Molina-Mora MJ, Alzueta J, et al. Persistence of secondary mitral regurgitation and response to cardiac resynchronization therapy. *Eur J Echocardiogr*. 2010 2010 Mar;11(2):131-7 - **Not relevant to Key Questions**
291. Cai C, Hua W, Ding L, et al. Association of renal function with cardiac reverse remodeling and long-term outcome in heart failure patients following cardiac resynchronization therapy. *Chin Med J (Engl)*. 2014;127(23):4036-42. PMID: 25430445. - **Does not address outcome of interest**
292. Cai C, Hua W, Ding LG, et al. Association of body mass index with cardiac reverse remodeling and long-term outcome in advanced heart failure patients with cardiac resynchronization therapy. *Circ J*. 2014;78(12):2899-907. PMID: 25345991. - **Does not address outcome of interest**
293. Cai C, Hua W, Ding LG, et al. High sensitivity C-reactive protein and cardiac resynchronization therapy in patients with advanced heart failure. *J Geriatr Cardiol*. 2014 Dec;11(4):296-302. doi: 10.11909/j.issn.1671-5411.2014.04.004. PMID: 25593578. - **Does not address outcome of interest**
294. Caldwell JC, Contractor H, Petkar S, et al. Atrial fibrillation is under-recognized in chronic heart failure:

- insights from a heart failure cohort treated with cardiac resynchronization therapy. *Europace*. 2009 2009 Oct;11(10):1295-300 - **Not relevant to Key Questions**
295. Caldwell JC, Contractor H, Petkar S, et al. Atrial fibrillation is under-recognized in chronic heart failure: insights from a heart failure cohort treated with cardiac resynchronization therapy. *Europace*. 2009 2009 Oct;11(10):1295-300. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
296. Caliskan E, Fischer F, Schoenrath F, et al. Epicardial left ventricular leads via minimally invasive technique: a role of steroid eluting leads. *J Cardiothorac Surg*. 2017 Nov 8;12(1):95. doi: 10.1186/s13019-017-0659-4. PMID: 29117867. - **Does not address outcome of interest**
297. Calo L, Martino A, de Ruvo E, et al. Acute echocardiographic optimization of multiple stimulation configurations of cardiac resynchronization therapy through quadripolar left ventricular pacing: a tailored approach. *Am Heart J*. 2014 Apr;167(4):546-54. doi: 10.1016/j.ahj.2013.12.028. PMID: 24655704. - **Does not address outcome of interest**
298. Cano Ó, Bellver A, Fontenla A, et al. Spanish results of the Second European Cardiac Resynchronization Therapy Survey (CRT-Survey II). *Rev Esp Cardiol (Engl Ed)*. 2019doi: 10.1016/j.rec.2019.02.003. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
299. Capasso F, Giunta A, Stabile G, et al. Left ventricular functional recovery during cardiac resynchronization therapy: predictive role of asynchrony measured by strain rate analysis. *Pacing Clin Electrophysiol*. 2005 2005 Jan;28 Suppl 1:S1-4. - **Other: not RCT and <30 patients**
300. Cappelli F, Porciani MC, Ricceri I, et al. Tricuspid annular plane systolic excursion evaluation improves selection of cardiac resynchronization therapy patients. *Clin. Cardiol*. 2010 2010;33(9):578-82 - **Not relevant to Key Questions**
301. Capria A, Santini L, Ventresca S, et al. Early upgrade from CRT-D to multiple-point pacing improves the myocardial and peripheral vascular remodeling in primary dilated cardiomyopathy. *Journal of interventional cardiac electrophysiology*. Conference: 13th annual congress of the european cardiac arrhythmia society, ECAS 2017. Italy. 2017;48:S50. doi: 10.1007/s10840-017-0231-0. PMID: CN-01406614. - **Not full report**
302. Capria A, Santini L, Ventresca S, et al. The QRS duration drives the myocardial effects of the upgrade from CRT-D to MPP in primary dilated cardio-myopathy, but shows weaker relationship with the short-term clues of peripheral vascular remodeling. *Journal of interventional cardiac electrophysiology*. Conference: 13th annual congress of the european cardiac arrhythmia society, ECAS

2017. Italy. 2017;48:S118. doi: 10.1007/s10840-017-0231-0. PMID: CN-01406613. – **Not full report**
303. Caputo ML, van Stipdonk A, Illner A, et al. The definition of left bundle branch block influences the response to cardiac resynchronization therapy. *Int J Cardiol.* 2018 Oct 15;269:165-9. doi: 10.1016/j.ijcard.2018.07.060. PMID: 30025653. -**Other: does not have a comparison group**
304. Cardiac resynchronization therapy in elderly: predictors of mortality at 12-months follow-up. *Europace.* 2018;Conference: 1st Annual Conference of the European Heart Rhythm Association, EHRA 2018. Spain. 20(Supplement 1):i53. doi: 10.1093/europace/euy015. PMID: CN-01657005. – **Not full report**
305. Carluccio E, Biagioli P, Alunni G, et al. Non-cardiac factors for prediction of response to cardiac resynchronization therapy: The value of baseline, and of serial changes, in red cell distribution width. *Int J Cardiol.* 2017 Sep 15;243:347-53. doi: 10.1016/j.ijcard.2017.05.123. PMID: 28600101. - **Does not address outcome of interest**
306. Carluccio E, Biagioli P, Alunni G, et al. Presence of extensive LV remodeling limits the benefits of CRT in patients with intraventricular dyssynchrony. *JACC Cardiovasc Imaging.* 2011 Oct;4(10):1067-76 - **Not relevant to Key Questions**
307. Carluccio E, Biagioli P, Alunni G, et al. Presence of extensive LV remodeling limits the benefits of CRT in patients with intraventricular dyssynchrony. *JACC Cardiovasc Imaging.* 2011 Oct;4(10):1067-76. - **Addresses only effectiveness, not an RCT**
308. Carnlof C, Insulander P, Jensen-Urstad M, et al. Atrio-ventricular junction ablation and pacemaker treatment: a comparison between men and women. *Scand Cardiovasc J.* 2018 Jun;52(3):120-6. doi: 10.1080/14017431.2018.1446549. PMID: 29537317. - **Addresses only effectiveness, not an RCT**
309. Castel MA, Magnani S, Mont L, et al. Survival in New York Heart Association class IV heart failure patients treated with cardiac resynchronization therapy compared with patients on optimal pharmacological treatment. *Europace.* 2010 2010 Aug;12(8):1136-40 - **Not relevant to Key Questions**
310. Castellant P, Fatemi M, Orhan E, et al. Patients with non-ischaemic dilated cardiomyopathy and hyper-responders to cardiac resynchronization therapy: characteristics and long-term evolution. *Europace.* 2009 2009 Mar;11(3):350-5 - **Not relevant to Key Questions**
311. Castellant P, Orhan E, Bertault-Valls V, et al. Is "hyper response" to cardiac resynchronization therapy in patients with nonischemic cardiomyopathy a recovery, a remission, or a control? *Ann Noninvasive Electrocardiol.* 2010 2010 Oct;15(4):321-7 - **Not relevant to Key Questions**

312. Catanzaro JN, Makaryus JN, Jadonath R, et al. Planning and guidance of cardiac resynchronization therapy–lead implantation by evaluating coronary venous anatomy assessed with multidetector computed tomography. *Clinical Medicine Insights: Cardiology*. 2014;2014((Catanzaro J.N.; Makaryus J.N.; Jadonath R.; Makaryus A.N., amakaryu@numc.edu) North Shore-LIJ Health System, Hofstra NSLIJ School of Medicine, New York, United States):43-50. doi: 10.4137/cmc.s18762. - **Does not address outcome of interest**
313. Cattadori G, Giraldi F, Berti M, et al. Assessment of cardiac resynchronization therapy response. *Int. J. Cardiol*. 2009 2009;136(2):240-2.-**Other: No mv adjustment and not rct**
314. Cazeau S, Bordachar P, Jauvert G, et al. Echocardiographic modeling of cardiac dyssynchrony before and during multisite stimulation: a prospective study. *Pacing Clin Electrophysiol*. 2003 2003 Jan;26(1 Pt 2):137-43. - **Addresses only effectiveness, not an RCT**
315. Cazeau S, Bordachar P, Jauvert G, et al. Echocardiographic modeling of cardiac dyssynchrony before and during multisite stimulation: a prospective study. *Pacing Clin Electrophysiol*. 2003 2003 Jan;26(1 Pt 2):137-43. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
316. Cazeau S, Ritter P, Lazarus A, et al. Multisite pacing for end-stage heart failure: early experience. *Pacing Clin Electrophysiol*. 1996 1996 Nov;19(11 Pt 2):1748-57. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
317. Cazeau SJ, Daubert JC, Tavazzi L, et al. Responders to cardiac resynchronization therapy with narrow or intermediate QRS complexes identified by simple echocardiographic indices of dyssynchrony: the DESIRE study. *Eur J Heart Fail*. 2008 2008 Mar;10(3):273-80. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
318. Celebi O, Knaus T, Blaschke F, et al. Extraordinarily favorable left ventricular reverse remodeling through long-term cardiac resynchronization: super-response to cardiac resynchronization. *Pacing Clin Electrophysiol*. 2012 2012 Jul;35(7):870-6. - **Addresses only effectiveness, not an RCT**
319. Celikyurt U, Açar B, Karauzum I, et al. Shorter time to begin of QRS fragmentation predicts non-response to cardiac resynchronization therapy in non-ischemic heart failure patients. *Rev Clin Esp*. 2019;219(5):243-50. doi: 10.1016/j.rce.2018.11.008. – **Not in English**
320. Celikyurt U, Agacdiken A, Geyik B, et al. Effect of cardiac resynchronization therapy on thyroid function. *Clin Cardiol*. 2011 2011 Nov;34(11):703-5 - **Not relevant to Key Questions**
321. Celikyurt U, Agacdiken A, Sahin T, et al. Association between red blood

- cell distribution width and response to cardiac resynchronization therapy. *J Interv Card Electrophysiol.* 2012 2012 Nov;35(2):215-8. - **Addresses only effectiveness, not an RCT**
322. Celikyurt U, Agacdiken A, Sahin T, et al. Number of leads with fragmented QRS predicts response to cardiac resynchronization therapy. *Clin Cardiol.* 2013 2013 Jan;36(1):36-9 - **Not relevant to Key Questions**
323. Celikyurt U, Agacdiken A, Sahin T, et al. Number of leads with fragmented QRS predicts response to cardiac resynchronization therapy. *Clin Cardiol.* 2013 2013 Jan;36(1):36-9. - **Addresses only effectiveness, not an RCT**
324. Celikyurt U, Agacdiken A, Sahin T, et al. Relationship between fragmented QRS and response to cardiac resynchronization therapy. *J Interv Card Electrophysiol.* 2012 2012 Dec;35(3):337-42; discussion 42 - **Not relevant to Key Questions**
325. Celikyurt U, Karauzum K, Sahin T, et al. Association between resolution of fragmented QRS and response to cardiac resynchronization therapy. *Ann Noninvasive Electrocardiol.* 2015 Mar;20(2):126-31. doi: 10.1111/anec.12186. PMID: 25039278. - **Does not address outcome of interest**
326. Celikyurt U, Vural A, Sahin T, et al. Relationship between left ventricular dyssynchrony and reverse remodeling after cardiac resynchronization therapy. *Clin Cardiol.* 2011 2011 Oct;34(10):645-8 - **Not relevant to Key Questions**
327. Cha YM, Rea RF, Wang M, et al. Response to cardiac resynchronization therapy predicts survival in heart failure: a single-center experience. *J Cardiovasc Electrophysiol.* 2007 2007 Sep;18(10):1015-9 - **Not relevant to Key Questions**
328. Cha YM, Rea RF, Wang M, et al. Response to cardiac resynchronization therapy predicts survival in heart failure: a single-center experience. *J Cardiovasc Electrophysiol.* 2007 2007 Sep;18(10):1015-9. - **Addresses only effectiveness, not an RCT**
329. Chamoun AJ, Lenihan DJ, McCulloch M, et al. Resynchronization therapy in dilated cardiomyopathy: confirmation of hemodynamic improvement with real-time three-dimensional echocardiography. *Circulation.* 2001 2001 May 15;103(19):E98-8. – **Single case study**
330. Chan DD, Wu KC, Loring Z, et al. Comparison of the relation between left ventricular anatomy and QRS duration in patients with cardiomyopathy with versus without left bundle branch block. *Am J Cardiol.* 2014 May 15;113(10):1717-22. doi: 10.1016/j.amjcard.2014.02.026. PMID: 24698465 - **Not relevant to Key Questions**
331. Chan DD, Wu KC, Loring Z, et al. Comparison of the relation between left ventricular anatomy and QRS duration in patients with cardiomyopathy with versus

- without left bundle branch block. Am J Cardiol. 2014 May 15;113(10):1717-22. doi: 10.1016/j.amjcard.2014.02.026. PMID: 24698465. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
332. Chan KL, Tang AS, Achilli A, et al. Functional and echocardiographic improvement following multisite biventricular pacing for congestive heart failure. Can J Cardiol. 2003 2003 Mar 31;19(4):387-90. - **Addresses only effectiveness, not an RCT**
333. Chan WYW, Blomqvist A, Melton IC, et al. Effects of AV delay and VV delay on left atrial pressure and waveform in ambulant heart failure patients: Insights into CRT optimization. PACE - Pacing and Clinical Electrophysiology. 2014;37(7):810-9. doi: 10.1111/pace.12362. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
334. Chan YH, Wu LS, Kuo CT, et al. Incremental value of inefficient deformation indices for predicting response to cardiac resynchronization therapy. J Am Soc Echocardiogr. 2013 2013 Mar;26(3):307-15 - **Not relevant to Key Questions**
335. Chandra R, Zolty R, Palma E. A left hemiblock improves cardiac resynchronization therapy outcomes in patients with a right bundle branch block. Clin Cardiol. 2010 2010 Feb;33(2):89-93 - **Not relevant to Key Questions**
336. Chang PC, Wo HT, Chen TH, et al. Remote Past Left Ventricular Function before Chronic Right Ventricular Pacing Predicts Responses to Cardiac Resynchronization Therapy Upgrade. Pacing Clin Electrophysiol. 2013 2013 Nov 19 - **Not relevant to Key Questions**
337. Chang PC, Wo HT, Chen TH, et al. Remote Past Left Ventricular Function before Chronic Right Ventricular Pacing Predicts Responses to Cardiac Resynchronization Therapy Upgrade. Pacing Clin Electrophysiol. 2013 2013 Nov 19. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
338. Chang PC, Wo HT, Chen TH, et al. Remote past left ventricular function before chronic right ventricular pacing predicts responses to cardiac resynchronization therapy upgrade. PACE - Pacing and Clinical Electrophysiology. 2014;37(4):454-63. doi: 10.1111/pace.12291. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
339. Chatterjee NA, Borgquist R, Chang Y, et al. Increasing sex differences in the use of cardiac resynchronization therapy with or without implantable cardioverter-defibrillator. Eur Heart J. 2017 May 14;38(19):1485-94. doi: 10.1093/eurheartj/ehw598. PMID: 28065904. - **Does not address outcome of interest**
340. Chatterjee NA, Gold MR, Waggoner AD, et al. Longer Left Ventricular Electric Delay Reduces

- Mitral Regurgitation After Cardiac Resynchronization Therapy: Mechanistic Insights From the SMART-AV Study (SmartDelay Determined AV Optimization: A Comparison to Other AV Delay Methods Used in Cardiac Resynchronization Therapy). *Circ Arrhythm Electrophysiol.* 2016 Nov;9(11)doi: 10.1161/circep.116.004346. PMID: 27906653. - **Does not address outcome of interest**
341. Chatterjee NA, Singh JP, Szymonifka J, et al. Incremental value of cystatin C over conventional renal metrics for predicting clinical response and outcomes in cardiac resynchronization therapy: The BIOCRT study. *Int J Cardiol.* 2016 Feb 15;205:43-9. doi: 10.1016/j.ijcard.2015.12.002. PMID: 26710332. - **Addresses only effectiveness, not an RCT**
342. Chatterjee NA, Upadhyay GA, Singal G, et al. Pre-capillary pulmonary hypertension and right ventricular dilation predict clinical outcome in cardiac resynchronization therapy. *JACC Heart Fail.* 2014 Jun;2(3):230-7. doi: 10.1016/j.jchf.2014.02.004. PMID: 24952689. - **Does not address outcome of interest**
343. Chaudhry FA, Shah A, Bangalore S, et al. Inotropic contractile reserve and response to cardiac resynchronization therapy in patients with markedly remodeled left ventricle. *J Am Soc Echocardiogr.* 2011 2011 Jan;24(1):91-7 - **Not relevant to Key Questions**
344. Chen JY, Lin KH, Chang KC, et al. The Shortest QRS Duration of an Electrocardiogram Might Be an Optimal Electrocardiographic Predictor for Response to Cardiac Resynchronization Therapy. *Int Heart J.* 2017 Aug 3;58(4):530-5. doi: 10.1536/ihj.16-364. PMID: 28701672. - **Does not address outcome of interest**
345. Chen L, Fu H, Pretorius VG, et al. Clinical Outcomes of Cardiac Resynchronization with Epicardial Left Ventricular Lead. *Pacing Clin Electrophysiol.* 2015 Oct;38(10):1201-9. doi: 10.1111/pace.12687. PMID: 26172535. - **Does not address outcome of interest**
346. Chen S, Yin Y, Krucoff MW. Effect of cardiac resynchronization therapy and implantable cardioverter defibrillator on quality of life in patients with heart failure: A meta-analysis. *Europace.* 2012 2012;14(11):1602-7. - **No original data**
347. Chen S, Yin Y, Krucoff MW. Effect of cardiac resynchronization therapy and implantable cardioverter defibrillator on quality of life in patients with heart failure: A meta-analysis. *Europace.* 2012 2012;14(11):1602-7. - **Addresses only effectiveness, not an RCT**
348. Chen TB, Cheng KA, Gao P, et al. Primary prevention of sudden cardiac death by implantable cardioverter-defibrillator therapy in Chinese patients with heart failure: a single-center experience. *Chin Med J (Engl).* 2010 2010 Apr 5;123(7):848-51.-**Other: QRS or LVEF not specified**

349. Chen Y, Yan J, Zhao S, et al. Efficacy of equilibrium radionuclide angiography to predict acute response to cardiac resynchronization therapy in patients with heart failure. *Nucl Med Commun.* 2015 Jun;36(6):610-8. doi: 10.1097/mnm.0000000000000287. PMID: 25759945. - **Addresses only effectiveness, not an RCT**
350. Chen YY, Shu XR, Su ZZ, et al. A Low-Normal Free Triiodothyronine Level Is Associated with Adverse Prognosis in Euthyroid Patients with Heart Failure Receiving Cardiac Resynchronization Therapy. *Int Heart J.* 2017 Dec 12;58(6):908-14. doi: 10.1536/ihj.16-477. PMID: 29151481. - **Does not address outcome of interest**
351. Chen Z, Sohal M, Sammut E, et al. Focal But Not Diffuse Myocardial Fibrosis Burden Quantification Using Cardiac Magnetic Resonance Imaging Predicts Left Ventricular Reverse Modeling Following Cardiac Resynchronization Therapy. *J Cardiovasc Electrophysiol.* 2016 Feb;27(2):203-9. doi: 10.1111/jce.12855. PMID: 26463874. - **Does not address outcome of interest**
352. Cheung JW, Ip JE, Markowitz SM, et al. Trends and outcomes of cardiac resynchronization therapy upgrade procedures: A comparative analysis using a United States National Database 2003-2013. *Heart Rhythm.* 2017 Jul;14(7):1043-50. doi: 10.1016/j.hrthm.2017.02.017. PMID: 28214565. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
353. Chiang KF, Cheng CM, Tsai SC, et al. Relationship of myocardial substrate characteristics as assessed by myocardial perfusion imaging and cardiac reverse remodeling levels after cardiac resynchronization therapy. *Ann Nucl Med.* 2016 Aug;30(7):484-93. doi: 10.1007/s12149-016-1083-x. PMID: 27221816. - **Does not address outcome of interest**
354. Chiang KF, Hung GU, Tsai SC, et al. Impact of cardiac reverse remodeling after cardiac resynchronization therapy assessed by myocardial perfusion imaging on ventricular arrhythmia. *J Nucl Cardiol.* 2017 Aug;24(4):1282-8. doi: 10.1007/s12350-016-0447-x. PMID: 26979308. - **Does not address outcome of interest**
355. Chmurawa J, Filipecki A, Filipecki K. CRT-P for ineffective RV pacing in variant angina. *Kardiol Pol.* 2014;72(2):203. doi: 10.5603/kp.2014.0034. - **Not full report**
356. Choi J, Radau P, Xu R, et al. X-ray and magnetic resonance imaging fusion for cardiac resynchronization therapy. *Med Image Anal.* 2016 Jul;31:98-107. doi: 10.1016/j.media.2016.03.004. PMID: 27025953. - **Does not address outcome of interest**
357. Choi Y, Byeon J, Jung MH, et al. Echocardiographic, Electrocardiographic Changes and Clinical Outcomes of Patients Who Respond to Cardiac Resynchronization Therapy after

- One Year. J Cardiovasc Ultrasound. 2017 Jun;25(2):63-9. doi: 10.4250/jcu.2017.25.2.63. PMID: 28770034. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
358. Christie S, Hiebert B, Seifer CM, et al. Clinical outcomes of cardiac resynchronization therapy with and without a defibrillator in elderly patients with heart failure. J Arrhythm. 2018((Christie S.) Max Rady College of Medicine, University of Manitoba, Winnipeg, MB, Canada)doi: 10.1002/joa3.12131. - **Addresses effectiveness questions only and is not RCT**
359. Chung ES, Patel N, Egnaczyk GF, et al. Analysis of strain in CRT patients with mild systolic dysfunction and LBBB: the miracle EF cohort. European journal of heart failure. Conference: heart failure 2016 and the 3rd world congress on acute heart failure. Florence italy. Conference start: 20160521. Conference end: 20160524. Conference publication: (var.pagings). 2016;18:380. doi: 10.1002/ejhf.539. PMID: CN-01267084. – **Not full report**
360. Chwyczko T, Sterlinski M, Maciag A, et al. Impact of cardiac resynchronisation therapy on adaptation of circulatory and respiratory systems to exercise assessed by cardiopulmonary exercise test in patients with chronic heart failure. Kardiol Pol. 2008 2008 Apr;66(4):406-12; discussion 13-4.-**Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
361. Ciampi Q, Pratali L, Citro R, et al. Additive value of severe diastolic dysfunction and contractile reserve in the identification of responders to cardiac resynchronization therapy. Eur J Heart Fail. 2011 2011 Dec;13(12):1323-30 - **Not relevant to Key Questions**
362. Ciampi Q, Pratali L, Citro R, et al. Additive value of severe diastolic dysfunction and contractile reserve in the identification of responders to cardiac resynchronization therapy. Eur J Heart Fail. 2011 2011 Dec;13(12):1323-30. - **Addresses only effectiveness, not an RCT**
363. Ciconte G, Calovic Z, Vicedomini G, et al. Multipoint pacing improves peripheral hemodynamic response: Noninvasive assessment using radial artery tonometry. Pacing Clin Electrophysiol. 2018 Feb;41(2):106-13. doi: 10.1111/pace.13254. PMID: 29222865. - **Addresses only effectiveness, not an RCT**
364. Cikes M, Sanchez Martinez S, Biering Sorensen T, et al. Machine-learning characterization of myocardial deformation patterns to identify responders to resynchronization therapy. European heart journal. Conference: european society of cardiology, ESC congress 2017. Spain. 2017;38(Supplement 1):1059. doi: 10.1093/eurheartj/ehx502.5118. PMID: CN-01468715. – **Not full report**

365. Cimino S, Palombizio D, Cicogna F, et al. Significant increase of flow kinetic energy in "nonresponders" patients to cardiac resynchronization therapy. *Echocardiography*. 2017 May;34(5):709-15. doi: 10.1111/echo.13518. PMID: 28332315. - **Does not address outcome of interest**
366. Cipriani M, Ammirati E, Landolina M, et al. Cumulative analysis on 4802 patients confirming that women benefit more than men from cardiac resynchronization therapy. *Int J Cardiol*. 2015;182(C):454-6. doi: 10.1016/j.ijcard.2015.01.028. - **No original data**
367. Cipriani M, Landolina M, Oliva F, et al. Women with nonischemic cardiomyopathy have a favorable prognosis and a better left ventricular remodeling than men after cardiac resynchronization therapy. *J Cardiovasc Med (Hagerstown)*. 2016 Apr;17(4):291-8. doi: 10.2459/jcm.000000000000187. PMID: 25222077. - **Addresses only effectiveness, not an RCT**
368. Cipriani M, Lunati M, Landolina M, et al. Prognostic implications of mitral regurgitation in patients after cardiac resynchronization therapy. *Eur J Heart Fail*. 2016 Aug;18(8):1060-8. doi: 10.1002/ejhf.569. PMID: 27412374. - **Does not address outcome of interest**
369. Ciszewski J, Maciag A, Kowalik I, et al. Comparison of the rhythm control treatment strategy versus the rate control strategy in patients with permanent or long-standing persistent atrial fibrillation and heart failure treated with cardiac resynchronization therapy - a pilot study of Cardiac Resynchronization in Atrial Fibrillation Trial (Pilot-CRAFT): study protocol for a randomized controlled trial. *Trials*. 2014 Oct 4;15:386. doi: 10.1186/1745-6215-15-386. PMID: 25281275. - **Other: study protocol**
370. Cleland J, Freemantle N, Ghio S, et al. Predicting the long-term effects of cardiac resynchronization therapy on mortality from baseline variables and the early response a report from the CARE-HF (Cardiac Resynchronization in Heart Failure) Trial. *J Am Coll Cardiol*. 2008 2008 Aug 5;52(6):438-45. - **Addresses only effectiveness, not an RCT**
371. Cleland JG, Daubert JC, Erdmann E, et al. Baseline characteristics of patients recruited into the CARE-HF study. *Eur J Heart Fail*. 2005 2005 Mar 2;7(2):205-14 - **Not relevant to Key Questions**
372. Clements IP, Christenson S, Hodge DO, et al. Symptom improvement after upgrade from right ventricular apical to biventricular pacing: Role of right and left ventricular volumes assessed with single-photon emission computed tomographic equilibrium radionuclide angiocardiology. *J Nucl Cardiol*. 2011 2011 Feb;18(1):43-51 - **Not relevant to Key Questions**
373. Clémenty N, Carion PL, de Léotoing L, et al. Infections and associated costs following cardiovascular implantable electronic device implantations: A nationwide cohort study. *Europace*. 2018;20(12):1974-80. doi: 10.1093/europace/eux387. - **Population inclusion criteria do**

**not fall within the QRS \geq 120ms
and LVEF \leq 35% range**

374. Clementy N, Laborie G, Pierre B, et al. Three-dimensional interlead distance predicts response and outcomes after cardiac resynchronization therapy. *Arch Cardiovasc Dis.* 2017 Nov;110(11):590-8. doi: 10.1016/j.acvd.2017.03.005. PMID: 28734687. - **Does not address outcome of interest**
375. Clerkin KJ, Topkara VK, Demmer RT, et al. Implantable Cardioverter-Defibrillators in Patients With a Continuous-Flow Left Ventricular Assist Device: An Analysis of the INTERMACS Registry. *JACC Heart Fail.* 2017 Dec;5(12):916-26. doi: 10.1016/j.jchf.2017.08.014. PMID: 29191299. - **Does not evaluate a CRT**
376. Comparison of Long-Term Survival Benefits With Cardiac Resynchronization Therapy in Patients With Mild Heart Failure With Versus Without Diabetes Mellitus (from the Multicenter Automatic Defibrillator Implantation Trial With Cardiac Resynchronization Therapy). *American Journal of Cardiology.* 2018doi: 10.1016/j.amjcard.2018.02.040. PMID: CN-01920259. - **Other: not subgroup of interest**
377. Conraads VM, Spruit MA, Braunschweig F, et al. Physical activity measured with implanted devices predicts patient outcome in chronic heart failure. *Circ Heart Fail.* 2014 2014 Mar 1;7(2):279-87 - **Not relevant to Key Questions**
378. Cooper JM, Patel RK, Emmi A, et al. RV-only pacing can produce a Q wave in lead I and an R wave in V1: Implications for biventricular pacing. *PACE - Pacing and Clinical Electrophysiology.* 2014;37(5):585-90. doi: 10.1111/pace.12327. PMID: 24372196. - **Does not address outcome of interest**
379. Coppola G, Ciaramitaro G, Stabile G, et al. Magnitude of QRS duration reduction after biventricular pacing identifies responders to cardiac resynchronization therapy. *Int J Cardiol.* 2016 Oct 15;221:450-5. doi: 10.1016/j.ijcard.2016.06.203. PMID: 27414720. - **Does not address outcome of interest**
380. Corbisiero R, Buck DC, Muller D, et al. What is the cost of non-response to cardiac resynchronization therapy? Hospitalizations and healthcare utilization in the CRT-D population. *J Interv Card Electrophysiol.* 2016 Nov;47(2):189-95. doi: 10.1007/s10840-016-0180-z. PMID: 27613184. - **Does not address outcome of interest**
381. Corbisiero R, Kazemian P, Bharmi R, et al. Less with More: Hospitalization Cost and Event Rates with Quadripolar versus Bipolar CRT-D System. *Pacing Clin Electrophysiol.* 2016 Oct;39(10):1038-45. doi: 10.1111/pace.12923. PMID: 27458058. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
382. Cortes M, Avila P, De La Cruz E, et al. Usefulness of implantable cardioverter defibrillator therapy in patients aged over 75 years as

- compared with optimal medical therapy. Journal of the American College of Cardiology. 2013;61(10 SUPPL. 1):E398. doi: 10.1016/s0735-1097%2813%2960398-8. PMID: CN-01008086. - **Does not address outcome of interest**
383. Coverstone E, Sheehy J, Kleiger RE, et al. The postimplantation electrocardiogram predicts clinical response to cardiac resynchronization therapy. Pacing Clin Electrophysiol. 2015 May;38(5):572-80. doi: 10.1111/pace.12609. PMID: 25732143. - **Does not address outcome of interest**
384. Covino G, Volpicelli M, Belli P, et al. A novel fluoroscopic method of measuring right-to-left interlead distance as a predictor of reverse left ventricular remodeling after cardiac resynchronization therapy. J Interv Card Electrophysiol. 2014 Mar;39(2):153-9. doi: 10.1007/s10840-013-9843-1. PMID: 24293175. - **Does not address outcome of interest**
385. Cowburn PJ, Patel H, Jolliffe RE, et al. Cardiac resynchronisation therapy: An option for inotrope-supported patients with end-stage heart failure? Eur. J. Heart Fail. 2005 2005;7(2):215-7. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
386. Cowburn PJ, Patel H, Jolliffe RE, et al. Cardiac resynchronization therapy: an option for inotrope-supported patients with end-stage heart failure? Eur J Heart Fail. 2005 Mar 2;7(2):215-7. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
387. Cowburn PJ, Patel H, Pipes RR, et al. Contrast nephropathy post cardiac resynchronization therapy: an under-recognized complication with important morbidity. Eur J Heart Fail. 2005 2005 Aug;7(5):899-903. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
388. Cozma D, Kalifa J, Pescariu S, et al. Global myocardial index in patients with multisite pacing. Rom J Intern Med. 2004 2004;42(3):521-31. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
389. Cundrle Jr I, Johnson BD, Somers VK, et al. Effect of cardiac resynchronization therapy on pulmonary function in patients with heart failure. American Journal of Cardiology. 2013;112(6):838-42. doi: 10.1016/j.amjcard.2013.05.012. PMID: 23747043
390. Curtis A, Worley S, Adamson P, et al. Clinical outcomes are improved with biventricular pacing compared to right ventricular pacing in patients with atrioventricular block: an analysis from the block hf study. Heart rhythm. 2013;10(9):1421. doi: 10.1016/j.hrthm.2013.07.042. PMID: CN-01024946. - **Not full report**
391. Curtis AB, Worley SJ, Adamson PB, et al. Biventricular pacing for atrioventricular block and systolic dysfunction. New England Journal of Medicine. 2013;368(17):1585-93. doi: 10.1056/NEJMoa1210356. - **Population inclusion criteria do**

- not fall within the QRS \geq 120ms and LVEF \leq 35% range**
392. Curtis AB, Worley SJ, Chung ES, et al. Improvement in Clinical Outcomes With Biventricular Versus Right Ventricular Pacing: The BLOCK HF Study. *J Am Coll Cardiol.* 2016 May 10;67(18):2148-57. doi: 10.1016/j.jacc.2016.02.051. PMID: 27151347. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
393. Cvijic M, Zizek D, Antolic B, et al. Electrocardiographic parameters predict super-response in cardiac resynchronization therapy. *J Electrocardiol.* 2015 Jul-Aug;48(4):593-600. doi: 10.1016/j.jelectrocard.2015.04.019. PMID: 25968915. - **Addresses only effectiveness, not an RCT**
394. D'Onofrio A, Caico SI, Iuliano A, et al. Incidence, predictors, and impact on outcome of increased left ventricular latency in patients undergoing cardiac resynchronization therapy. *Journal of Interventional Cardiac Electrophysiology.* 2018;51(3):245-52. doi: 10.1007/s10840-018-0321-7. PMID: 29502194. - **Addresses only effectiveness, not an RCT**
395. Da Costa A, Thevenin J, Roche F, et al. Prospective validation of stress echocardiography as an identifier of cardiac resynchronization therapy responders. *Heart Rhythm.* 2006 Apr;3(4):406-13. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
396. da Silva Menezes A. Outcome of right ventricular bifocal pacing in patients with permanent atrial fibrillation and severe dilated cardiomyopathy due to Chagas disease: three years of follow-up. *J Interv Card Electrophysiol.* 2004 Dec;11(3):193-8. - **Does not evaluate a CRT**
397. da Silva Menezes A. Outcome of right ventricular bifocal pacing in patients with permanent atrial fibrillation and severe dilated cardiomyopathy due to Chagas disease: three years of follow-up. *J Interv Card Electrophysiol.* 2004 Dec;11(3):193-8. - **Addresses only effectiveness, not an RCT**
398. Daimee UA, Biton Y, Aktas MK, et al. Effect of Significant Weight Change on Inappropriate Implantable Cardioverter-Defibrillator Therapy. *Pacing Clin Electrophysiol.* 2017 Jan;40(1):9-16. doi: 10.1111/pace.12973. PMID: 27808410. - **Does not address outcome of interest**
399. Daimee UA, Biton Y, Moss AJ, et al. Effect of cardiac resynchronization therapy on the risk of ventricular tachyarrhythmias in patients with chronic kidney disease. *Ann Noninvasive Electrocardiol.* 2017 May;22(3)doi: 10.1111/anec.12404. PMID: 27629147. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
400. Daimee UA, Klein HU, Giudici MC, et al. Right ventricular lead location, right-left ventricular lead interaction, and long-term outcomes in cardiac resynchronization therapy patients. *J Interv Card*

- Electrophysiol. 2018 Jul;52(2):185-94. doi: 10.1007/s10840-018-0332-4. PMID: 29572715. - **Addresses only effectiveness, not an RCT**
401. Daimee UA, Moss AJ, Biton Y, et al. Long-Term Outcomes With Cardiac Resynchronization Therapy in Patients With Mild Heart Failure With Moderate Renal Dysfunction. *Circ Heart Fail.* 2015 Jul;8(4):725-32. doi: 10.1161/circheartfailure.115.002082. PMID: 26038537. - **Does not address outcome of interest**
402. Daly DD, Jr., Maran A, Hyer JM, et al. The Effect of Chronic Kidney Disease on Mortality with Cardiac Resynchronization Therapy. *Pacing Clin Electrophysiol.* 2016 Aug;39(8):863-9. doi: 10.1111/pace.12883. PMID: 27197959. - **Addresses only effectiveness, not an RCT**
403. Damy T, Ghio S, Rigby AS, et al. Interplay between right ventricular function and cardiac resynchronization therapy: An analysis of the care-HF trial (Cardiac resynchronization-heart Failure). *J Am Coll Cardiol.* 2013;61(21):2153-60. doi: 10.1016/j.jacc.2013.02.049. PMID: 23541971. - **Does not address outcome of interest**
404. D'Andrea A, Caso P, Scarafile R, et al. Effects of global longitudinal strain and total scar burden on response to cardiac resynchronization therapy in patients with ischaemic dilated cardiomyopathy. *Eur J Heart Fail.* 2009 2009 Jan;11(1):58-67 - **Not relevant to Key Questions**
405. D'Andrea A, Salerno G, Scarafile R, et al. Right ventricular myocardial function in patients with either idiopathic or ischemic dilated cardiomyopathy without clinical sign of right heart failure: effects of cardiac resynchronization therapy. *Pacing Clin Electrophysiol.* 2009 2009 Aug;32(8):1017-29 - **Not relevant to Key Questions**
406. D'Andrea A, Scarafile R, Riegler L, et al. Right atrial size and deformation in patients with dilated cardiomyopathy undergoing cardiac resynchronization therapy. *Eur J Heart Fail.* 2009 2009 Dec;11(12):1169-77. - **Addresses only effectiveness, not an RCT**
407. D'Andrea A, Scarafile R, Riegler L, et al. Right atrial size and deformation in patients with dilated cardiomyopathy undergoing cardiac resynchronization therapy. *Eur J Heart Fail.* 2009 2009 Dec;11(12):1169-77. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
408. Daubert C, Gold MR, Abraham WT, et al. Prevention of disease progression by cardiac resynchronization therapy in patients with asymptomatic or mildly symptomatic left ventricular dysfunction: insights from the European cohort of the REVERSE (Resynchronization Reverses Remodeling in Systolic Left Ventricular Dysfunction) trial. *J Am Coll Cardiol.* 2009 2009 Nov 10;54(20):1837-46. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**

409. Davis DR, Krahn AD, Tang AS, et al. Long-term outcome of cardiac resynchronization therapy in patients with severe congestive heart failure. *Can J Cardiol*. 2005 Apr;21(5):413-7. - **Addresses only effectiveness, not an RCT**
410. Davoodi G, Bagheri A, Yamini-Sharif A, et al. Evaluation of In-Hospital NT-proBNP Changes in Heart Failure Patients to Identify the Six-Month Clinical Response Following Cardiac Resynchronization Therapy. *Acta Med Iran*. 2014 Jan;52(1):15-23. - **Addresses only effectiveness, not an RCT**
411. Daya HA, Alam MB, Adelstein E, et al. Echocardiography-guided left ventricular lead placement for cardiac resynchronization therapy in ischemic vs nonischemic cardiomyopathy patients. *Heart Rhythm*. 2014 Apr;11(4):614-9 - **Not relevant to Key Questions**
412. De Cock CC, Van Campen LM, Jessurun ER, et al. Long-term follow-up of patients with refractory heart failure and myocardial ischemia treated with cardiac resynchronization therapy. *Pacing Clin Electrophysiol*. 2005 Jan;28 Suppl 1:S8-S10. - **Addresses only effectiveness, not an RCT**
413. de la Cruz E, Cortes M, Farre J, et al. Comparison of pharmacological treatment alone versus treatment combined with cardiac resynchronization therapy in patients over 75 years. *J Interv Card Electrophysiol*. 2015 Jun;43(1):13-20. doi: 10.1007/s10840-015-9979-2. PMID: 25687979. - **Does not address outcome of interest**
414. de Lepper AGW, Herold IHF, Saporito S, et al. Noninvasive pulmonary transit time: A new parameter for general cardiac performance. *Echocardiography*. 2017 Aug;34(8):1138-45. doi: 10.1111/echo.13590. PMID: 28600804. - **Does not address outcome of interest**
415. de Roest GJ, Allaart CP, Kleijn SA, et al. Prediction of long-term outcome of cardiac resynchronization therapy by acute pressure-volume loop measurements. *Eur J Heart Fail*. 2013 Mar;15(3):299-307 - **Not relevant to Key Questions**
416. De Roest GJ, Wu L, De Cock CC, et al. Scar tissue-guided left ventricular lead placement for cardiac resynchronization therapy in patients with ischemic cardiomyopathy: An acute pressure-volume loop study. *Am Heart J*. 2014;167(4):537-45. doi: 10.1016/j.ahj.2014.01.004. - **Does not address outcome of interest**
417. de Sisti A, Toussaint JF, Lavergne T, et al. Determinants of mortality in patients undergoing cardiac resynchronization therapy: baseline clinical, echocardiographic, and angioscintigraphic evaluation prior to resynchronization. *Pacing Clin Electrophysiol*. 2005 Dec;28(12):1260-70. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
418. De Sutter J, De Bondt P, Van de Wiele C, et al. Prevalence of potential candidates for biventricular pacing among patients with known coronary artery disease: a prospective registry from a single

- center. Pacing Clin Electrophysiol. 2000 2000 Nov;23(11 Pt 2):1718-21. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
419. de Teresa E, Gomez-Doblas JJ, Lamas G, et al. Preventing ventricular dysfunction in pacemaker patients without advanced heart failure: rationale and design of the PREVENT-HF study. Europace. 2007 2007 Jun;9(6):442-6. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
420. De Waard D, Manlucu J, Gillis A, et al. The effect of cardiac resynchronization therapy on outcomes in women: a substudy of the resynchronization-defibrillation for ambulatory heart failure trial. Journal of the american college of cardiology. Conference: 67th annual scientific session of the american college of cardiology and i2 summit: innovation in intervention, ACC. 2018;18. United States. 71(11 Supplement 1) (no pagination)doi: 10.1016/s0735-1097%2818%2930988-4. PMID: CN-01570220. – **Not full report**
421. Deering T, Brugada J, Primo J, et al. Reduction of 30-day hospital readmissions with device-based CRT optimization in patients with a Non-LBBB IVCD or a QRS $<$ 150ms. Europace. Conference: european heart rhythm association EUROPACE-CARDIOSTIM 2017 congress. Austria. 2017;19(Supplement 3):iii97-iii8. PMID: CN-01421507. – **Not full report**
422. Deering T, Singh JP, Oswald H, et al. Reduction of 30-day hospital readmissions with device-based CRT optimization in patients with renal dysfunction. Heart rhythm. Conference: 38th annual scientific sessions of the heart rhythm society, heart rhythm 2017. United states. 2017;14(5 Supplement 1):S315. PMID: CN-01399998. – **Not full report**
423. Del Greco M, Zorzi A, Di Matteo I, et al. Coronary sinus activation patterns in patients with and without left bundle branch block undergoing electroanatomic mapping system-guided cardiac resynchronization therapy device implantation. Heart Rhythm. 2017 Feb;14(2):225-33. doi: 10.1016/j.hrthm.2016.10.025. PMID: 27989791. - **Addresses only effectiveness, not an RCT**
424. Delgado V, Ypenburg C, Zhang Q, et al. Changes in global left ventricular function by multidirectional strain assessment in heart failure patients undergoing cardiac resynchronization therapy. J Am Soc Echocardiogr. 2009 2009 Jun;22(6):688-94 - **Not relevant to Key Questions**
425. Delgado-Montero A, Tayal B, Goda A, et al. Additive Prognostic Value of Echocardiographic Global Longitudinal and Global Circumferential Strain to Electrocardiographic Criteria in Patients With Heart Failure Undergoing Cardiac Resynchronization Therapy. Circ Cardiovasc Imaging. 2016 Jun;9(6)doi: 10.1161/circimaging.115.004241. PMID: 27252359. - **Does not address outcome of interest**
426. Delnoy PP, Ottervanger JP, Luttikhuis HO, et al. Clinical

response of cardiac resynchronization therapy in the elderly. Am Heart J. 2008 Apr;155(4):746-51. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**

427. Delnoy PP, Ottervanger JP, Luttikhuis HO, et al. Comparison of usefulness of cardiac resynchronization therapy in patients with atrial fibrillation and heart failure versus patients with sinus rhythm and heart failure. Am J Cardiol. 2007 2007 May 1;99(9):1252-7 - **Not relevant to Key Questions**
428. Delnoy PP, Ottervanger JP, Luttikhuis HO, et al. Long-term clinical response of cardiac resynchronization after chronic right ventricular pacing. Am J Cardiol. 2009 2009 Jul 1;104(1):116-21 - **Not relevant to Key Questions**
429. Delnoy PP, Ottervanger JP, Luttikhuis HO, et al. Sustained benefit of cardiac resynchronization therapy. J Cardiovasc Electrophysiol. 2007 2007 Mar;18(3):298-302. - **Addresses only effectiveness, not an RCT**
430. Delnoy PP, Singh JP, Alzueta J, et al. Repetitive CRT optimization is associated with significant echo-remodeling and improved clinical response in CRT-D patients with LBBB QRS $<$ 150MS. Heart rhythm. Conference: 38th annual scientific sessions of the heart rhythm society, heart rhythm 2017. United states. 2017;14(5 Supplement 1):S41. PMID: CN-01400175. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
431. Demetriades P, Bell A, Gubran C, et al. Suitability of cardiac resynchronisation therapy in patients with Fontan circulation and congenitally corrected transposition of the great arteries. Int J Cardiol. 2017 Dec 15;249:166-8. doi: 10.1016/j.ijcard.2017.08.066. PMID: 28886927. - **Does not address outcome of interest**
432. Dendy KF, Powell BD, Cha YM, et al. Anodal stimulation: an underrecognized cause of nonresponders to cardiac resynchronization therapy. Indian Pacing Electrophysiol J. 2011 2011;11(3):64-72 - **Not relevant to Key Questions**
433. Deneke T, Lawo T, Gerritse B, et al. Mortality of patients with implanted cardioverter/defibrillators in relation to episodes of atrial fibrillation. Europace. 2004 2004;6(2):151-8 - **Not relevant to Key Questions**
434. Derval N, Bordachar P, Lim HS, et al. Impact of pacing site on QRS duration and its relationship to hemodynamic response in cardiac resynchronization therapy for congestive heart failure. J Cardiovasc Electrophysiol. 2014 Sep;25(9):1012-20. doi: 10.1111/jce.12464. PMID: 24891271 - **Not relevant to Key Questions**
435. Derval N, Bordachar P, Lim HS, et al. Impact of pacing site on QRS duration and its relationship to hemodynamic response in cardiac resynchronization therapy for congestive heart failure. J

- Cardiovasc Electrophysiol. 2014 Sep;25(9):1012-20. doi: 10.1111/jce.12464. PMID: 24891271. - **Does not address outcome of interest**
436. Desai H, Aronow WS, Ahn C, et al. Incidence of appropriate cardioverter-defibrillator shocks and mortality in patients with heart failure treated with combined cardiac resynchronization plus implantable cardioverter-defibrillator therapy versus implantable cardioverter-defibrillator therapy. *J Cardiovasc Pharmacol Ther.* 2010 2010 Mar;15(1):37-40 - **Not relevant to Key Questions**
437. Desai H, Aronow WS, Tsai FS, et al. Statins reduce appropriate cardioverter-defibrillator shocks and mortality in patients with heart failure and combined cardiac resynchronization and implantable cardioverter-defibrillator therapy. *J Cardiovasc Pharmacol Ther.* 2009 2009 Sep;14(3):176-9 - **Not relevant to Key Questions**
438. DeVecchi F, Facchini E, Degiovanni A, et al. Acute contractile recovery extent during biventricular pacing is not associated with follow-up in patients undergoing resynchronization. *Int J Cardiol Heart Vasc.* 2016 Jun;11:66-73. doi: 10.1016/j.ijcha.2016.03.012. PMID: 28616528. - **Does not address outcome of interest**
439. Dhillon O, Rahena T, Hunter RJ, et al. Do quadripolar left ventricular leads offer any benefit over bipolar leads in cardiac resynchronisation therapy? the quad-CRT randomised controlled trial. *Heart rhythm.* 2014;11(5 SUPPL. 1):S431-S2. doi: 10.1016/j.hrthm.2014.03.034. PMID: CN-01010770. - **Not full report**
440. Di Molfetta A, Forleo GB, Santini L, et al. A novel methodology for AV and VV delay optimization in CRT: results from a randomized pilot clinical trial. *Journal of Artificial Organs.* 2013;16(3):273-83. doi: 10.1007/s10047-013-0701-9. PMID: CN-01123967. - **Does not address outcome of interest**
441. Diab O, Lotfy HAA, Khalid S. Reverse electric remodeling after cardiac resynchronization therapy and relation to clinical and echocardiographic outcomes. *Egyptian Heart Journal.* 2014;66(4):343-50. doi: 10.1016/j.ehj.2013.12.085. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
442. Diaz-Infante E, Mont L, Leal J, et al. Predictors of lack of response to resynchronization therapy. *Am J Cardiol.* 2005 2005 Jun 15;95(12):1436-40. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
443. Diaz-Infante E, Sitges M, Vidal B, et al. Usefulness of ventricular dyssynchrony measured using M-mode echocardiography to predict response to resynchronization therapy. *Am J Cardiol.* 2007 2007 Jul 1;100(1):84-9. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
444. Dickstein K, Bogale N, Priori S, et al. The European cardiac

- resynchronization therapy survey. Eur Heart J. 2009 2009 Oct;30(20):2450-60 - **Not relevant to Key Questions**
445. Ding L, Hua W, Zhang S, et al. Improvement of P wave dispersion after cardiac resynchronization therapy for heart failure. J Electrocardiol. 2009 2009 Jul-Aug;42(4):334-8 - **Not relevant to Key Questions**
446. Ding LG, Hua W, Zhang S, et al. Decrease of plasma N-terminal pro beta-type natriuretic peptide as a predictor of clinical improvement after cardiac resynchronization therapy for heart failure. Chin Med J (Engl). 2009 2009 Mar 20;122(6):617-21 - **Not relevant to Key Questions**
447. Dixon LJ, Murtagh JG, Richardson SG, et al. Reduction in hospitalization rates following cardiac resynchronisation therapy in cardiac failure: experience from a single centre. Europace. 2004 2004 Nov;6(6):586-9. - **Addresses only effectiveness, not an RCT**
448. Dizon J, Horn E, Neglia J, et al. Loss of left bundle branch block following biventricular pacing therapy for heart failure: evidence for electrical remodeling? J Interv Card Electrophysiol. 2004 2004 Feb;10(1):47-50. - **Single case study**
449. Djordjevic Dikic A, Nikcevic G, Raspopovic S, et al. Prognostic role of coronary flow reserve for left ventricular functional improvement after cardiac resynchronization therapy in patients with dilated cardiomyopathy. Eur Heart J Cardiovasc Imaging. 2014 Dec;15(12):1344-9. doi: 10.1093/ehjci/jeu136. PMID: 25053732. - **Does not address outcome of interest**
450. Doltra A, Bijmens B, Tolosana JM, et al. Mechanical abnormalities detected with conventional echocardiography are associated with response and midterm survival in CRT. JACC Cardiovasc Imaging. 2014 Oct;7(10):969-79. doi: 10.1016/j.jcmg.2014.03.022. PMID: 25240452. - **Does not address outcome of interest**
451. Dominguez-Rodriguez A, Abreu-Gonzalez P, Jimenez-Sosa A, et al. The impact of frailty in older patients with non-ischaemic cardiomyopathy after implantation of cardiac resynchronization therapy defibrillator. Europace. 2015 Apr;17(4):598-602. doi: 10.1093/europace/euu333. PMID: 25564552. - **Addresses only effectiveness, not an RCT**
452. Dominguez-Rodriguez A, Abreu-Gonzalez P, Piccolo R, et al. Melatonin is associated with reverse remodeling after cardiac resynchronization therapy in patients with heart failure and ventricular dyssynchrony. Int J Cardiol. 2016 Oct 15;221:359-63. doi: 10.1016/j.ijcard.2016.07.056. PMID: 27404706. - **Addresses only effectiveness, not an RCT**
453. Donahue T, Niazi I, Leon A, et al. Acute and chronic response to CRT in narrow QRS patients. J Cardiovasc Transl Res. 2012 2012 Apr;5(2):232-41 - **Not relevant to Key Questions**
454. Donahue T, Niazi I, Leon A, et al. Acute and chronic response to CRT

- in narrow QRS patients. *J Cardiovasc Transl Res.* 2012 2012 Apr;5(2):232-41. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
455. Donal E, Delgado V, Magne J, et al. Rational and design of EuroCRT: an international observational study on multi-modality imaging and cardiac resynchronization therapy. *Eur Heart J Cardiovasc Imaging.* 2017 Oct 1;18(10):1120-7. doi: 10.1093/ehjci/jex021. PMID: 28329299. **Other:study design**
456. Donal E, Hernandez A, Hubert A, et al. Imaging in the field of cardiac resynchronization therapy: a real additive value? *Acta Cardiol.* 2017 Jun;72(3):237-9. doi: 10.1080/00015385.2017.1305199. PMID: 28636517. – **No original data**
457. Donal E, Thibault H, Bergerot C, et al. Right ventricular pump function after cardiac resynchronization therapy: a strain imaging study. *Arch Cardiovasc Dis.* 2008 2008 Jul-Aug;101(7-8):475-84. - **Addresses only effectiveness, not an RCT**
458. Dong Ying-Xue YX, Oh JK, Yang YZ, et al. Left ventricular 12 segmental strain imaging predicts response to cardiac resynchronization therapy. *Chin Med J (Engl).* 2013;126(14):2620-4. doi: 10.3760/cma.j.issn.0366-6999.20122125. PMID: 23876883. - **Addresses only effectiveness, not an RCT**
459. D'Onofrio A, Botto G, Mantica M, et al. Incremental Value of Larger Interventricular Conduction Time in Improving Cardiac Resynchronization Therapy Outcome in Patients with Different QRS Duration. *J Cardiovasc Electrophysiol.* 2014 2014 Feb 4 - **Not relevant to Key Questions**
460. D'Onofrio A, Palmisano P, Rapacciuolo A, et al. Effectiveness of a management program for outpatient clinic or remote titration of beta-blockers in CRT patients: The RESTORE study. *Int J Cardiol.* 2017 Jun 1;236:290-5. doi: 10.1016/j.ijcard.2017.02.015. PMID: 28188000. - **Does not address outcome of interest**
461. Döring M, Braunschweig F, Eitel C, et al. Individually tailored left ventricular lead placement: Lessons from multimodality integration between three-dimensional echocardiography and coronary sinus angiogram. *Europace.* 2013;15(5):718-27. doi: 10.1093/europace/eus396. -**Other: prior review**
462. Doshi RN, Daoud EG, Fellows C, et al. Left ventricular-based cardiac stimulation post AV nodal ablation evaluation (the PAVE study). *J Cardiovasc Electrophysiol.* 2005 2005 Nov;16(11):1160-5. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
463. Doyle CL, Huang DT, Moss AJ, et al. Response of right ventricular size to treatment with cardiac resynchronization therapy and the risk of ventricular tachyarrhythmias in MADIT-CRT. *Heart Rhythm.* 2013;10(10):1471-7. doi: 10.1016/j.hrthm.2013.07.029. PMID: CN-01122435. - **Does not address outcome of interest**

464. Drozd M, Gierula J, Lowry JE, et al. Cardiac resynchronization therapy outcomes in patients with chronic heart failure: cardiac resynchronization therapy with pacemaker versus cardiac resynchronization therapy with defibrillator. *J Cardiovasc Med (Hagerstown)*. 2017 Dec;18(12):962-7. doi: 10.2459/jcm.0000000000000584. PMID: 29045311. - **Addresses only effectiveness, not an RCT**
465. Duncker D, Delnoy PP, Nagele H, et al. First clinical evaluation of an atrial haemodynamic sensor lead for automatic optimization of cardiac resynchronization therapy. *Europace*. 2016 May;18(5):755-61. doi: 10.1093/europace/euv114. PMID: 25976907. - **Does not address outcome of interest**
466. Duncker D, Friedel K, Konig T, et al. Cardiac resynchronization therapy improves psycho-cognitive performance in patients with heart failure. *Europace*. 2015 Sep;17(9):1415-21. doi: 10.1093/europace/euv005. PMID: 25745071. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
467. Earley A, Persson R, Garlitski AC, et al. Effectiveness of implantable cardioverter defibrillators for primary prevention of sudden cardiac death in subgroups a systematic review. *Ann Intern Med*. 2014 2014 Jan 21;160(2):111-21. - **No original data**
468. Ebert M, Richter S, Dinov B, et al. Evaluation and management of ventricular tachycardia in patients with dilated cardiomyopathy. *Heart Rhythm*. 2019;16(4):624-31. doi: 10.1016/j.hrthm.2018.10.028. - **No original data**
469. Edner M, Kim Y, Hansen KN, et al. Prevalence and inter-relationship of different Doppler measures of dyssynchrony in patients with heart failure and prolonged QRS: A report from CARE-HF. *Cardiovasc. Ultrasound*. 2009 2009;7(1) - **Not relevant to Key Questions**
470. Edner M, Ring M, Henriksson P. Pre-implant right ventricular function might be an important predictor of the response to cardiac resynchronization therapy. *Cardiovasc Ultrasound*. 2011 2011;9:28. - **Addresses only effectiveness, not an RCT**
471. Egan P, Wilkoff BL, Tchou P. Interruption of Pacing Following Nonsustained Ventricular Tachycardia in an AAI Programmed Implantable Cardioverter Defibrillator. *Pacing Clin Electrophysiol*. 2015 Sep;38(9):1082-90. doi: 10.1111/pace.12672. PMID: 26010870. - **Does not address outcome of interest**
472. Eickholt C, Siekiera M, Kirmanoglou K, et al. Improvement of left ventricular function under cardiac resynchronization therapy goes along with a reduced incidence of ventricular arrhythmia. *PLoS One*. 2012 2012;7(11):e48926 - **Not relevant to Key Questions**
473. Eickholt C, Siekiera M, Kirmanoglou K, et al. Improvement of left ventricular function under cardiac resynchronization therapy goes along with a reduced incidence

- of ventricular arrhythmia. PLoS One. 2012 2012;7(11):e48926. - **Addresses only effectiveness, not an RCT**
474. Eisen A, Suleiman M, Strasberg B, et al. Renal dysfunction and clinical outcomes of patients undergoing ICD and CRTD implantation: data from the Israeli ICD registry. J Cardiovasc Electrophysiol. 2014 Sep;25(9):990-7. doi: 10.1111/jce.12442. PMID: 24761993. - **Does not evaluate a CRT**
475. Eisen A, Suleiman M, Strasberg B, et al. Renal dysfunction and clinical outcomes of patients undergoing ICD and CRTD implantation: data from the Israeli ICD registry. J Cardiovasc Electrophysiol. 2014 Sep;25(9):990-7. doi: 10.1111/jce.12442. PMID: 24761993. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
476. Elamragy A, Wahab AA, Diab R, et al. Randomized comparative clinical study between echocardiographic-based and electrogram-based optimization of patients with cardiac resynchronization therapy. Journal of interventional cardiac electrophysiology. 2014;39(1 SUPPL. 1):S68-S9. doi: 10.1007/s10840-014-9877-z. PMID: CN-01055702. - **Not full report**
477. Elencwajg B, Lopez Cabanillas N, Cardinali EL, et al. The Jurdham procedure: endocardial left ventricular lead insertion via a femoral transseptal sheath for cardiac resynchronization therapy pectoral device implantation. Heart Rhythm. 2012 2012 Nov;9(11):1798-804. - **Addresses only effectiveness, not an RCT**
478. Ellery S, Pakrashi T, Paul V, et al. Predicting mortality and rehospitalization in heart failure patients with Home Monitoring - The Home CARE pilot study. Clin. Res. Cardiol. 2006 2006;95(3 SUPPL.):III/29-III/35 - **Not relevant to Key Questions**
479. Ellims AH, Pfluger H, Elsik M, et al. Utility of cardiac magnetic resonance imaging, echocardiography and electrocardiography for the prediction of clinical response and long-term survival following cardiac resynchronisation therapy. Int. J. Card. Imaging. 2013 2013;29(6):1303-11. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
480. ElMaghawry M, Farouk M. REVERSE 5-year follow up: CRT impact persists. Glob Cardiol Sci Pract. 2014;2014(3):245-8. doi: 10.5339/gcsp.2014.39. PMID: 25763376. - **No original data**
481. Elming MB, Hammer-Hansen S, Nyktari E, et al. Myocardial fibrosis and the effect of defibrillator implantation in patients with non-ischemic systolic heart failure - DANISH-MRI. European heart journal. Conference: european society of cardiology, ESC congress 2017. Spain. 2017;38(Supplement 1):54. doi: 10.1093/eurheartj/ehx502.295. PMID: CN-01469083. - **Not full report**

482. El-Saed A, Voigt A, Shalaby A. Usefulness of brain natriuretic peptide level at implant in predicting mortality in patients with advanced but stable heart failure receiving cardiac resynchronization therapy. *Clin Cardiol.* 2009 2009 Nov;32(11):E33-8. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
483. Emerek K, Friedman DJ, Sorensen PL, et al. The Association of a classical left bundle Branch Block Contraction Pattern by vendor-independent strain echocardiography and outcome after cardiac resynchronization therapy. *Cardiovasc Ultrasound.* 2019 May 21;17(1):10. doi: 10.1186/s12947-019-0160-4. PMID: 31113440. - **Addresses effectiveness questions only and is not RCT**
484. Emerek K, Friedman DJ, Sorensen PL, et al. Vectorcardiographic QRS area is associated with long-term outcome after cardiac resynchronization therapy. *Heart Rhythm.* 2018 Aug 28doi: 10.1016/j.hrthm.2018.08.028. PMID: 30170227. - **Addresses only effectiveness, not an RCT**
485. Emerek K, Friedman DJ, Sørensen PL, et al. Vectorcardiographic QRS area is associated with long-term outcome after cardiac resynchronization therapy. *Heart Rhythm.* 2019;16(2):213-9. doi: 10.1016/j.hrthm.2018.08.028. - **Addresses effectiveness questions only and is not RCT**
486. Emerek K, Risum N, Hjortshoj S, et al. New strict left bundle branch block criteria reflect left ventricular activation differences. *J Electrocardiol.* 2015 Sep-Oct;48(5):758-62. doi: 10.1016/j.jelectrocard.2015.07.008. PMID: 26233647. - **Addresses only effectiveness, not an RCT**
487. Engels EB, Vegh EM, Van Deursen CJ, et al. T-wave area predicts response to cardiac resynchronization therapy in patients with left bundle branch block. *J Cardiovasc Electrophysiol.* 2015 Feb;26(2):176-83. doi: 10.1111/jce.12549. PMID: 25230363 - **Not relevant to Key Questions**
488. Engels EB, Vegh EM, Van Deursen CJ, et al. T-wave area predicts response to cardiac resynchronization therapy in patients with left bundle branch block. *J Cardiovasc Electrophysiol.* 2015 Feb;26(2):176-83. doi: 10.1111/jce.12549. PMID: 25230363. - **Does not address outcome of interest**
489. Enina TN, Kuznetsov VA, Soldatova AM, et al. Gender in cardiac resynchronisation therapy. *Journal of Cardiovascular and Thoracic Research.* 2018;10(4):197-202. doi: 10.15171/jcvtr.2018.34. - **Does not address outcome of interest**
490. Enomoto K, Yamabe H, Toyama K, et al. Improvement effect on endothelial function in patients with congestive heart failure treated with cardiac resynchronization therapy. *J Cardiol.* 2011 2011 Jul;58(1):69-73. - **Addresses only effectiveness, not an RCT**

491. Enomoto K, Yamabe H, Toyama K, et al. Improvement effect on endothelial function in patients with congestive heart failure treated with cardiac resynchronization therapy. *J Cardiol*. 2011 Jul;58(1):69-73. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
492. Epstein AJ, Polsky D, Yang F, et al. Geographic variation in implantable cardioverter-defibrillator use and heart failure survival. *Med Care*. 2012 Jan;50(1):10-7 - **Not relevant to Key Questions**
493. Erath JW, Vamos M, Domokos D, et al. Effects of implantation of quadripolar left ventricular leads on CRT response. *Journal of Interventional Cardiac Electrophysiology*. 2019;55(1):73-81. doi: 10.1007/s10840-019-00545-8. - **Addresses effectiveness questions only and is not RCT**
494. Erdogan A, Rueckleben S, Tillmanns HH, et al. Proportion of candidates for cardiac resynchronization therapy. *Pacing Clin Electrophysiol*. 2003 Jan;26(1 Pt 2):152-4. - **Does not evaluate a CRT**
495. Erdogan A, Rueckleben S, Tillmanns HH, et al. Proportion of candidates for cardiac resynchronization therapy. *Pacing Clin Electrophysiol*. 2003 Jan;26(1 Pt 2):152-4. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
496. Ezelsoy M, Bayram M, Yazici S, et al. Surgical placement of left ventricular lead for cardiac resynchronization therapy after failure of percutaneous attempt. *Cardiovasc J Afr*. 2017 Jan/Feb;28(1):19-22. doi: 10.5830/cvja-2016-046. PMID: 28262910. - **Addresses only effectiveness, not an RCT**
497. Faber L, Vlachoianis M, Oldenburg O, et al. Long-term follow-up of cardiac resynchronization therapy: mechanical resynchronization and reverse left ventricular remodeling are predictive for long-term transplant-free survival. *Int J Cardiovasc Imaging*. 2012 Aug;28(6):1341-50 - **Not relevant to Key Questions**
498. Fabiszak T, Lach P, Ratajczak J, et al. Influence of QRS duration and axis on response to cardiac resynchronization therapy in chronic heart failure with reduced left ventricular ejection fraction: A single center study including patients with left bundle branch block. *Cardiol J*. 2018 Nov 16doi: 10.5603/CJ.a2018.0138. PMID: 30444259. - **Addresses effectiveness questions only and is not RCT**
499. Fabregat-Andres O, Garcia-Gonzalez P, Valle-Munoz A, et al. Clinical Benefit of Cardiac Resynchronization Therapy With a Defibrillator in Patients With an Ejection Fraction $>35\%$ Estimated by Cardiac Magnetic Resonance. *Rev Esp Cardiol*. 2014 Feb;67(2):107-13 - **Not relevant to Key Questions**
500. Facchini E, Varalda M, Sartori C, et al. Systolic heart failure and cardiac resynchronization therapy: a focus on diastole. *Int J Cardiovasc*

- Imaging. 2014 Jun;30(5):897-905. doi: 10.1007/s10554-014-0412-1. PMID: 24706254 - **Not relevant to Key Questions**
501. Facchini E, Varalda M, Sartori C, et al. Systolic heart failure and cardiac resynchronization therapy: a focus on diastole. *Int J Cardiovasc Imaging*. 2014 Jun;30(5):897-905. doi: 10.1007/s10554-014-0412-1. PMID: 24706254. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
502. Fadol AP, Mouhayar E, Reyes-Gibby CC. The Use of Cardiac Resynchronization Therapy in Cancer Patients with Heart Failure. *J Clin Exp Res Cardiol*. 2017 Apr;3(1)doi: 10.15744/2394-6504.3.105. PMID: 29962508. - **Addresses only effectiveness, not an RCT**
503. Faghfourian Md B, Homayoonfar Md S, Rezvanjoo Md M, et al. Comparison of hemodynamic effects of biventricular versus left ventricular only pacing in patients receiving cardiac resynchronization therapy: A before-after clinical trial. *J Arrhythm*. 2017 Apr;33(2):127-9. doi: 10.1016/j.joa.2016.07.014. PMID: 28416979. - **Addresses only effectiveness, not an RCT**
504. Fang F, Chan JYS, Lee APW, et al. Improved coronary artery blood flow following the correction of systolic dyssynchrony with cardiac resynchronization therapy. *Int J Cardiol*. 2013;167(5):2167-71. doi: 10.1016/j.ijcard.2012.05.094. PMID: 22704862. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
505. Fang F, Luo XX, Zhang Q, et al. Deterioration of left ventricular systolic function in extended Pacing to Avoid Cardiac Enlargement (PACE) trial: the predictive value of early systolic dyssynchrony. *Europace*. 2015 Oct;17 Suppl 2:ii47-53. doi: 10.1093/europace/euv130. PMID: 26842115. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
506. Fantoni C, Raffa S, Regoli F, et al. Cardiac resynchronization therapy improves heart rate profile and heart rate variability of patients with moderate to severe heart failure. *J Am Coll Cardiol*. 2005 2005 Nov 15;46(10):1875-82. - **Addresses only effectiveness, not an RCT**
507. Faran A, Dabrowska-Kugacka A, Lewicka-Nowak E, et al. Echocardiographic evaluation of patients with severe heart failure and impairment of intraventricular conduction following cardiac resynchronisation therapy. *Kardiol Pol*. 2008 2008 Apr;66(4):396-403; discussion 4-5. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
508. Faran A, Lewicka-Nowak E, Dabrowska-Kugacka A, et al. Cardiac resynchronisation therapy in patients with end-stage heart failure--long-term follow-up. *Kardiol Pol*. 2008 2008 Jan;66(1):19-26; discussion 7.- **Other: <30 patients**
509. Farwell D, Patel NR, Hall A, et al. How many people with heart failure are appropriate for biventricular resynchronization? *Eur Heart J*.

- 2000 Aug;21(15):1246-50.-
Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.
510. Fatemi M, Etienne Y, Castellant P, et al. Primary failure of cardiac resynchronization therapy: what are the causes and is it worth considering a second attempt? A single-centre experience. *Europace*. 2008 Nov;10(11):1308-12 - **Not relevant to Key Questions**
511. Fazelifar AF, Bonakdar HR, Alizadeh K, et al. Relationship between QRS complex notch and ventricular dyssynchrony in patients with heart failure and prolonged QRS duration. *Cardiol J*. 2008;15(4):351-6. - **Does not evaluate a CRT**
512. Fedorco M, Bulava A, Šantavý P, et al. Middle-term stability of epicardial left ventricular electrodes for cardiac resynchronization therapy. *Cor et Vasa*. 2017;59(6):e530-e9. doi: 10.1016/j.crvasa.2016.12.010. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
513. Fehrendt SF, Seifert MS, Moeller VM, et al. Long term results of the leadless CRT (WiSE-CRT) in patients with failed implantation of a conventional CRT device. *Europace*. Conference: european heart rhythm association EUROPACE-CARDIOSTIM 2017 congress. Austria. 2017;19(Supplement 3):iii16. PMID: CN-01421470. – **Not full report**
514. Feneon D, Behaghel A, Bernard A, et al. Left atrial function, a new predictor of response to cardiac resynchronization therapy? *Heart Rhythm*. 2015 Aug;12(8):1800-6. doi: 10.1016/j.hrthm.2015.04.021. PMID: 25896013.-**Other: mechanical study**
515. Ferdaushi UH, Ali MA, Islam N, et al. Short Term Outcome of Cardiac Resynchronization Therapy on Functional Recovery of Patients with Congestive Heart Failure in Bangladeshi Population. *Mymensingh Med J*. 2019 Jan;28(1):105-13. PMID: 30755558. - **Addresses effectiveness questions only and is not RCT**
516. Ferreira Santos J, Caetano F, Parreira L, et al. Effects of Cardiac Resynchronization Therapy on Right Ventricular Function - Evaluation with Tissue Doppler Echocardiography: Efeitos da Terapeutica de Ressincronizacao Ventricular na Funcao Ventricular Direita - Avaliacao por Ecocardiografia com Doppler Tecidular. *Rev. Port. Cardiol*. 2003;22(11):1347-55.-**Other: prediction <30**
517. Ferreira Santos J, Caetano F, Parreira L, et al. Tissue Doppler Echocardiography for Evaluation of Patients with Ventricular Resynchronization Therapy: Ecocardiografia com Doppler Tecidular para Avaliacao de Doentes com Terapeutica de Ressincronizacao Ventricular. *Rev. Port. Cardiol*. 2003

- 2003;22(11):1363-71.-**Other: prediction <30 pts**
518. Ferri-Certić J, Zavrli-Džananović D, Ležaić L, et al. Impact of left ventricular pacing threshold on ventricular arrhythmia occurrence in cardiac resynchronization therapy. *J Cardiol*. 2019((Ferri-Certić J.) Department of Cardiology, General Hospital Dubrovnik, Dubrovnik, Croatia)doi: 10.1016/j.jjcc.2019.03.015. - **Addresses effectiveness questions only and is not RCT**
519. Ferro A, Duilio C, Santomauro M, et al. Haemodynamic effects of dual-chamber pacing versus ventricular pacing during a walk test in patients with depressed or normal left ventricular function. *Eur J Nucl Med Mol Imaging*. 2005 2005 Sep;32(9):1075-80. - **Addresses only effectiveness, not an RCT**
520. Fink T, Rexha E, Schluter M, et al. Positive impact of pulmonary vein isolation on biventricular pacing in non-responders to cardiac resynchronization therapy. *Heart Rhythm*. 2018 Sep 28doi: 10.1016/j.hrthm.2018.09.028. PMID: 30273766.- **Other: does not eval effectiveness of crt; looks at non-responders**
521. Fishbein DP, Hellkamp AS, Mark DB, et al. Use of the 6-min walk distance to identify variations in treatment benefits from implantable cardioverter-defibrillator and amiodarone: results from the SCD-HeFT (Sudden Cardiac Death in Heart Failure Trial). *J Am Coll Cardiol*. 2014 Jun 17;63(23):2560-8. doi: 10.1016/j.jacc.2014.02.602. PMID: 24727258. - **Does not evaluate a CRT**
522. Flore V, Bartunek J, Goethals M, et al. Electrical remodeling reflected by QRS and T vector changes following cardiac resynchronization therapy is related to survival in heart failure patients with left bundle branch block. *J Electrocardiol*. 2015 Jul-Aug;48(4):578-85. doi: 10.1016/j.jelectrocard.2015.02.004. PMID: 25747167. - **Population inclusion criteria do not fall within the QRS≥120ms and LVEF ≤35% range**
523. Foley PW, Chalil S, Khadjooi K, et al. Effects of cardiac resynchronization therapy in patients unselected for mechanical dyssynchrony. *Int J Cardiol*. 2010 2010 Aug 6;143(1):51-6 - **Not relevant to Key Questions**
524. Foley PW, Chalil S, Khadjooi K, et al. Left ventricular reverse remodelling, long-term clinical outcome, and mode of death after cardiac resynchronization therapy. *Eur J Heart Fail*. 2011 2011 Jan;13(1):43-51 - **Not relevant to Key Questions**
525. Foley PW, Muhyaldeen SA, Chalil S, et al. Long-term effects of upgrading from right ventricular pacing to cardiac resynchronization therapy in patients with heart failure. *Europace*. 2009 2009 Apr;11(4):495-501 - **Not relevant to Key Questions**
526. Foley PW, Stegemann B, Ng K, et al. Growth differentiation factor-15 predicts mortality and morbidity after cardiac resynchronization therapy. *Eur Heart J*. 2009 2009

Nov;30(22):2749-57 - **Not relevant to Key Questions**

527. Fonarow GC, Albert NM, Curtis AB, et al. Incremental Reduction in Risk of Death Associated With Use of Guideline-Recommended Therapies in Patients With Heart Failure: A Nested Case-Control Analysis of IMPROVE HF. *J Am Heart Assoc.* 2012 2012 Feb;1(1):16-26. - **Does not evaluate a CRT**
528. Fonarow GC, Albert NM, Curtis AB, et al. Incremental Reduction in Risk of Death Associated With Use of Guideline-Recommended Therapies in Patients With Heart Failure: A Nested Case-Control Analysis of IMPROVE HF. *J Am Heart Assoc.* 2012 2012 Feb;1(1):16-26. - **Addresses only effectiveness, not an RCT**
529. Fontaine JM, Franklin SM, Essilfie G, et al. Cardiac resynchronization therapy: A comparative analysis of mortality in African Americans and Caucasians. *Pacing Clin Electrophysiol.* 2018 May;41(5):536-45. doi: 10.1111/pace.13326. PMID: 29570216. - **Does not address outcome of interest**
530. Fontaine JM, Franklin SM, Gupta A, et al. Mortality in African-Americans Following Cardiac Resynchronization Therapy: A Single Center Experience. *J Natl Med Assoc.* 2016 Feb;108(1):30-9. doi: 10.1016/j.jnma.2015.12.005. PMID: 26928486. - **Addresses only effectiveness, not an RCT**
531. Fontaine JM, Gupta A, Franklin SM, et al. Biventricular paced QRS predictors of left ventricular lead locations in relation to mortality in cardiac resynchronization therapy. *J Electrocardiol.* 2015 Mar-Apr;48(2):226-35. doi: 10.1016/j.jelectrocard.2014.12.011. PMID: 25552478. - **Addresses only effectiveness, not an RCT**
532. Ford J, Sears S, Ramza B, et al. The Registry Evaluating Functional Outcomes of Resynchronization Management (REFORM): quality of life and psychological functioning in patients receiving cardiac resynchronization therapy. *J Cardiovasc Electrophysiol.* 2014 2014 Jan;25(1):43-51. - **Addresses only effectiveness, not an RCT**
533. Forleo GB, Santini L, Giammaria M, et al. Multipoint pacing via a quadripolar left-ventricular lead: preliminary results from the Italian registry on multipoint left-ventricular pacing in cardiac resynchronization therapy (IRON-MPP). *Europace.* 2017 Jul 1;19(7):1170-7. doi: 10.1093/europace/euw094. PMID: 27189954. - **Addresses only effectiveness, not an RCT**
534. Forleo GB, Solimene F, Pisanò EC, et al. Long-term outcomes after prophylactic ICD and CRT-D implantation in non-ischemic patients: Analysis from a nationwide database of daily remote-monitoring transmissions. *J Cardiovasc Electrophysiol.* 2019((Forleo G.B.) Azienda Ospedaliera - Polo Universitario-Luigi Sacco, Milano, United States)doi: 10.1111/jce.14006. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**

535. Fournet M, Bernard A, Marechaux S, et al. Pilot study using 3D-longitudinal strain computation in a multi-parametric approach for best selecting responders to cardiac resynchronization therapy. *Cardiovasc Ultrasound*. 2017 Jun 17;15(1):15. doi: 10.1186/s12947-017-0107-6. PMID: 28623910. - **Does not address outcome of interest**
536. Franke J, Keppler J, Abadei AK, et al. Long-term outcome of patients with and without super-response to CRT-D. *Clin Res Cardiol*. 2016 Apr;105(4):341-8. doi: 10.1007/s00392-015-0926-0. PMID: 26497005. - **Does not address outcome of interest**
537. Friedman DJ, Bao H, Spatz ES, et al. Association Between a Prolonged PR Interval and Outcomes of Cardiac Resynchronization Therapy: A Report From the National Cardiovascular Data Registry. *Circulation*. 2016 Nov 22;134(21):1617-28. doi: 10.1161/circulationaha.116.022913. PMID: 27760795. - **Addresses only effectiveness, not an RCT**
538. Friedman DJ, Upadhyay GA, Rajabali A, et al. Progressive ventricular dysfunction among nonresponders to cardiac resynchronization therapy: baseline predictors and associated clinical outcomes. *Heart Rhythm*. 2014 Nov;11(11):1991-8. doi: 10.1016/j.hrthm.2014.08.005. PMID: 25106864. - **Other: prior review**
539. Frigerio M, Lunati M, Pasqualucci D, et al. Left ventricular ejection fraction overcrossing 35% after one year of cardiac resynchronization therapy predicts long term survival and freedom from sudden cardiac death: Single center observational experience. *Int J Cardiol*. 2014 2014 Mar 1;172(1):64-71 - **Not relevant to Key Questions**
540. Frigerio M, Lunati M, Pasqualucci D, et al. Left ventricular ejection fraction overcrossing 35% after one year of cardiac resynchronization therapy predicts long term survival and freedom from sudden cardiac death: Single center observational experience. *Int J Cardiol*. 2014 2014 Mar 1;172(1):64-71. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
541. Frohlich G, Steffel J, Hurlimann D, et al. Upgrading to resynchronization therapy after chronic right ventricular pacing improves left ventricular remodelling. *Eur Heart J*. 2010 2010 Jun;31(12):1477-85 - **Not relevant to Key Questions**
542. Frohlich G, Steffel J, Hurlimann D, et al. Upgrading to resynchronization therapy after chronic right ventricular pacing improves left ventricular remodelling. *Eur Heart J*. 2010 2010 Jun;31(12):1477-85. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
543. Fujinami M, Kondo H, Yufu K, et al. Association between the baseline peripheral blood monocyte counts, the size of spleen, and the response to cardiac resynchronization therapy. *J Cardiol*. 2018 Mar;71(3):299-304. doi: 10.1016/j.jjcc.2017.09.004. PMID:

29054593. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
544. Fujiwara R, Yoshida A, Fukuzawa K, et al. Discrepancy between Electrical and Mechanical Dyssynchrony in Patients with Heart Failure and an Electrical Disturbance. *Pacing Clin Electrophysiol.* 2013 2013 Dec 20 - **Not relevant to Key Questions**
545. Fukuda Y, Onishi T, Suzuki A, et al. Follow-up of Cardiac Fabry Disease Treated by Cardiac Resynchronization Therapy. *CASE.* 2017;1(4):134-7. doi: 10.1016/j.case.2017.04.004. - **Single case study**
546. Fumagalli S, Pieragnoli P, Ricciardi G, et al. Cardiac resynchronization therapy improves functional status and cognition. *Int J Cardiol.* 2016 Sep 15;219:212-7. doi: 10.1016/j.ijcard.2016.06.001. PMID: 27332741. - **Addresses only effectiveness, not an RCT**
547. Fumagalli S, Potpara TS, Bjerregaard Larsen T, et al. Frailty syndrome: an emerging clinical problem in the everyday management of clinical arrhythmias. The results of the European Heart Rhythm Association survey. *Europace.* 2017 Nov 1;19(11):1896-902. doi: 10.1093/europace/eux288. PMID: 29040554. - **Does not address outcome of interest**
548. Fumagalli S, Valsecchi S, Boriani G, et al. Comparison of the usefulness of cardiac resynchronization therapy in three age-groups (<65, 65-74 and (greater-than or equal to)75 years) (from the InSync/InSync ICD Italian Registry). *Am. J. Cardiol.* 2011 2011;107(10):1510-6.-**Other: QRS not in MV mode**
549. Funck RC, Koelsch S, Waldhans S, et al. Marked improvement in left ventricular function and significant reverse left ventricular remodeling within 3 months of cardiac resynchronization therapy in patients with dilated cardiomyopathy. *Pacing Clin Electrophysiol.* 2005 2005 Jan;28 Suppl 1:S5-7. - **Addresses only effectiveness, not an RCT**
550. Fung JW, Lam YY, Zhang Q, et al. Effect of left ventricular lead concordance to the delayed contraction segment on echocardiographic and clinical outcomes after cardiac resynchronization therapy. *J Cardiovasc Electrophysiol.* 2009 2009 May;20(5):530-5.-**Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
551. Fung JW, Yip GW, Zhang Q, et al. Improvement of left atrial function is associated with lower incidence of atrial fibrillation and mortality after cardiac resynchronization therapy. *Heart Rhythm.* 2008 2008 Jun;5(6):780-6. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
552. Fung JW, Yu CM, Chan JY, et al. Effects of cardiac resynchronization therapy on incidence of atrial fibrillation in patients with poor left

- ventricular systolic function. Am J Cardiol. 2005 2005 Sep 1;96(5):728-31 - **Not relevant to Key Questions**
553. Fung JW, Yu CM, Chan JY, et al. Effects of cardiac resynchronization therapy on incidence of atrial fibrillation in patients with poor left ventricular systolic function. Am J Cardiol. 2005 2005 Sep 1;96(5):728-31. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
554. Fung JW, Zhang Q, Yip GW, et al. Effect of cardiac resynchronization therapy in patients with moderate left ventricular systolic dysfunction and wide QRS complex: a prospective study. J Cardiovasc Electrophysiol. 2006 2006 Dec;17(12):1288-92. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
555. Fusco A. NYHA functional class IV patients: Cardiac Resynchronization therapy with defibrillator back up. Mediterr. J. Pacing Electrophysiol. 2007 2007;9(2):106-8. - **No original data**
556. Fyenbo DB, Sommer A, Kühl JT, et al. Transmural Myocardial Scar Assessed by Cardiac Computed Tomography: Predictor of Echocardiographic Versus Clinical Response to Cardiac Resynchronization Therapy? J Comput Assist Tomogr. 2019;43(2):312-6. doi: 10.1097/rct.0000000000000824. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
557. Gabrielli L, Marincheva G, Bijmens B, et al. Septal flash predicts cardiac resynchronization therapy response in patients with permanent atrial fibrillation. Europace. 2014 2014 Feb 26 - **Not relevant to Key Questions**
558. Gabrielli L, Marincheva G, Bijmens B, et al. Septal flash predicts cardiac resynchronization therapy response in patients with permanent atrial fibrillation. Europace. 2014;16(9):1342-9. doi: 10.1093/europace/euu023. - **Does not address outcome of interest**
559. Gad SA, Martin S, Kimber S, et al. Impact of Cardiac Resynchronization Therapy on Daily Physical Activity in Heart Failure Patients. J Cardiopulm Rehabil Prev. 2018 Aug 27doi: 10.1097/hcr.0000000000000345. PMID: 30142127. - **Does not address outcome of interest**
560. Gadler F, Valzania C, Linde C. Current use of implantable electrical devices in Sweden: data from the Swedish pacemaker and implantable cardioverter-defibrillator registry. Europace. 2015 Jan;17(1):69-77. doi: 10.1093/europace/euu233. PMID: 25336667.-**Other: no population details**
561. Gage RM, Burns KV, Bank AJ. Echocardiographic and clinical response to cardiac resynchronization therapy in heart failure patients with and without previous right ventricular pacing. Eur J Heart Fail. 2014 Nov;16(11):1199-205. doi: 10.1002/ejhf.143. PMID: 25132044. - **Addresses only effectiveness, not an RCT**

562. Gage RM, Curtin AE, Burns KV, et al. Changes in electrical dyssynchrony by body surface mapping predict left ventricular remodeling in patients with cardiac resynchronization therapy. *Heart Rhythm*. 2017 Mar;14(3):392-9. doi: 10.1016/j.hrthm.2016.11.019. PMID: 27867072. - **Addresses only effectiveness, not an RCT**
563. Gaita F, Bocchiardo M, Porciani MC, et al. Should stimulation therapy for congestive heart failure be combined with defibrillation backup? *Am J Cardiol*. 2000 Nov 2;86(9A):165K-58K - **Not relevant to Key Questions**
564. Galizio NO, Pesce R, Valero E, et al. Which patients with congestive heart failure may benefit from biventricular pacing? *Pacing Clin Electrophysiol*. 2003 Jan;26(1 Pt 2):158-61. - **Does not evaluate a CRT**
565. Galizio NO, Pesce R, Valero E, et al. Which patients with congestive heart failure may benefit from biventricular pacing? *Pacing Clin Electrophysiol*. 2003 Jan;26(1 Pt 2):158-61. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
566. Gallego Muñoz C, Saldarriaga CI, Cañas Arenas EM, et al. Evaluation of the response to cardiac resynchronisation therapy in a group of patients taking part in a heart failure program. *Revista Colombiana de Cardiología*. 2017;24(6):567-73. doi: 10.1016/j.rccar.2017.04.003. – **Not in English**
567. Galli E, Leclercq C, Fournet M, et al. Value of Myocardial Work Estimation in the Prediction of Response to Cardiac Resynchronization Therapy. *J Am Soc Echocardiogr*. 2018 Feb;31(2):220-30. doi: 10.1016/j.echo.2017.10.009. PMID: 29246513. - **Does not address outcome of interest**
568. Galli E, Leclercq C, Hubert A, et al. Role of myocardial constructive work in the identification of responders to CRT. *Eur Heart J Cardiovasc Imaging*. 2018 Sep 1;19(9):1010-8. doi: 10.1093/ehjci/jex191. PMID: 28954293. - **Does not address outcome of interest**
569. Galve E, Oristrell G, Acosta G, et al. Cardiac resynchronization therapy is associated with a reduction in ICD therapies as it improves ventricular function. *Clin Cardiol*. 2018 Jun;41(6):803-8. doi: 10.1002/clc.22958. PMID: 29604094. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
570. Ganesha Babu G, Webber M, Providencia R, et al. Ventricular Arrhythmia Burden in Patients With Heart Failure and Cardiac Resynchronization Devices: The Importance of Renal Function. *J Cardiovasc Electrophysiol*. 2016 Nov;27(11):1328-36. doi: 10.1111/jce.13080. PMID: 27566538. - **Addresses only effectiveness, not an RCT**
571. Garcia B, Clementy N, Benhenda N, et al. Mortality after atrioventricular nodal radiofrequency catheter ablation

- with permanent ventricular pacing in atrial fibrillation. *Circulation: Arrhythmia and Electrophysiology*. 2016;9(7)doi: 10.1161/circep.116.003993. - **Addresses only effectiveness, not an RCT**
572. Garcia B, Clementy N, Benhenda N, et al. Mortality After Atrioventricular Nodal Radiofrequency Catheter Ablation With Permanent Ventricular Pacing in Atrial Fibrillation: Outcomes From a Controlled Nonrandomized Study. *Circ Arrhythm Electrophysiol*. 2016 Jul;9(7)doi: 10.1161/circep.116.003993. PMID: 27363705. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
573. Garcia-Seara J, Iglesias Alvarez D, Alvarez Alvarez B, et al. Cardiac resynchronization therapy response in heart failure patients with different subtypes of true left bundle branch block. *J Interv Card Electrophysiol*. 2018 Jun;52(1):91-101. doi: 10.1007/s10840-018-0363-x. PMID: 29616388. - **Addresses only effectiveness, not an RCT**
574. García-Seara J, Iglesias Alvarez D, Alvarez Alvarez B, et al. Cardiac resynchronization therapy response in heart failure patients with different subtypes of true left bundle branch block. *Journal of Interventional Cardiac Electrophysiology*. 2018;52(1):91-101. doi: 10.1007/s10840-018-0363-x. - **Addresses effectiveness questions only and is not RCT**
575. Garcia-Seara J, Martinez-Sande JL, Cid B, et al. Influence of the preimplantation QRS axis on responses to cardiac resynchronization therapy. *Rev Esp Cardiol*. 2008 2008 Dec;61(12):1245-52.-**Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
576. Garrigue S, Jais P, Espil G, et al. Comparison of chronic biventricular pacing between epicardial and endocardial left ventricular stimulation using Doppler tissue imaging in patients with heart failure. *Am J Cardiol*. 2001 Oct 15;88(8):858-62. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
577. Garrigue S, Reuter S, Labeque JN, et al. Usefulness of biventricular pacing in patients with congestive heart failure and right bundle branch block. *Am J Cardiol*. 2001 Dec 15;88(12):1436-41, A8 - **Not relevant to Key Questions**
578. Gasior Z, Plonska-Gosciniak E, Kulach A, et al. Impact of septal flash and left ventricle contractile reserve on positive remodeling during 1 year cardiac resynchronization therapy: the multicenter ViaCRT study. *Arch Med Sci*. 2016 Apr 1;12(2):349-52. doi: 10.5114/aoms.2016.59260. PMID: 27186179. - **Addresses only effectiveness, not an RCT**
579. Gasparini M, Auricchio A, Regoli F, et al. Four-year efficacy of cardiac resynchronization therapy

- on exercise tolerance and disease progression: the importance of performing atrioventricular junction ablation in patients with atrial fibrillation. *J Am Coll Cardiol.* 2006 Aug 15;48(4):734-43 - **Not relevant to Key Questions**
580. Gasparini M, Block PC. Efficacy of CRT on exercise tolerance and disease progression: The importance of AV junction ablation in patients with atrial fibrillation. *ACC Cardiosource Rev. J.* 2006 2006;15(11):39-42 - **Not relevant to Key Questions**
581. Gasparini M, Klersy C, Leclercq C, et al. Validation of a simple risk stratification tool for patients implanted with Cardiac Resynchronization Therapy: the VALID-CRT risk score. *Eur J Heart Fail.* 2015 Jul;17(7):717-24. doi: 10.1002/ejhf.269. PMID: 25903349. - **Does not address outcome of interest**
582. Gasparini M, Kloppe A, Lunati M, et al. Atrioventricular junction ablation in patients with atrial fibrillation treated with cardiac resynchronization therapy: positive impact on ventricular arrhythmias, implantable cardioverter-defibrillator therapies and hospitalizations. *Eur J Heart Fail.* 2017 Dec 18;doi: 10.1002/ejhf.1117. PMID: 29251799. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
583. Gasparini M, Leclercq C, Lunati M, et al. Cardiac Resynchronization Therapy in Patients With Atrial Fibrillation: The CERTIFY Study (Cardiac Resynchronization Therapy in Atrial Fibrillation Patients Multinational Registry). *JACC Heart Fail.* 2013 Dec;1(6):500-7 - **Not relevant to Key Questions**
584. Gasparini M, Lunati M, Landolina M, et al. Electrical storm in patients with biventricular implantable cardioverter defibrillator: incidence, predictors, and prognostic implications. *Am Heart J.* 2008 2008 Nov;156(5):847-54 - **Not relevant to Key Questions**
585. Gasparini M, Mantica M, Galimberti P, et al. Beneficial effects of biventricular pacing in patients with a "narrow" QRS. *Pacing Clin Electrophysiol.* 2003 2003 Jan;26(1 Pt 2):169-74. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
586. Gasparini M, Mantica M, Galimberti P, et al. Biventricular pacing via a persistent left superior vena cava: report of four cases. *Pacing Clin Electrophysiol.* 2003 2003 Jan;26(1 Pt 2):192-6 - **Not relevant to Key Questions**
587. Gasparini M, Mantica M, Galimberti P, et al. Is the outcome of cardiac resynchronization therapy related to the underlying etiology? *Pacing Clin Electrophysiol.* 2003 2003 Jan;26(1 Pt 2):175-80. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
588. Gasparini M, Mantica M, Galimberti P, et al. Relief of drug refractory angina by biventricular pacing in heart failure. *Pacing Clin Electrophysiol.* 2003 2003 Jan;26(1

Pt 2):181-4 - **Not relevant to Key Questions**

589. Gazzoni GF, Fraga MB, Ferrari ADL, et al. Predictors of Total Mortality and Echocardiographic Response for Cardiac Resynchronization Therapy: A Cohort Study. *Arq Bras Cardiol.* 2017 Dec;109(6):569-78. doi: 10.5935/abc.20170171. PMID: 29185615. - **Does not address outcome of interest**
590. Ge Y, Ruwald AC, Kutuyifa V, et al. A Metric for Evaluating the Cardiac Response to Resynchronization Therapy. *Am J Cardiol.* 2014 2014 Jan 31. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
591. Ge Y, Ruwald ACH, Kutuyifa V, et al. A metric for evaluating the cardiac response to resynchronization therapy. *American Journal of Cardiology.* 2014;113(8):1371-7. doi: 10.1016/j.amjcard.2014.01.410. - **Does not address outcome of interest**
592. Gendre R, Lairez O, Mondoly P, et al. Research of predictive factors for cardiac resynchronization therapy: a prospective study comparing data from phase-analysis of gated myocardial perfusion single-photon computed tomography and echocardiography : Trying to anticipate response to CRT. *Ann Nucl Med.* 2017 Apr;31(3):218-26. doi: 10.1007/s12149-017-1148-5. PMID: 28197975. - **Addresses only effectiveness, not an RCT**
593. Ghanbari H, Feldman D, Schmidt M, et al. Cardiac resynchronization therapy device implantation in patients with therapeutic international normalized ratios. *PACE Pacing Clin. Electrophysiol.* 2010 2010;33(4):400-6. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
594. Ghani A, Delnoy P, Adiyaman A, et al. Predictors and long-term outcome of super-responders to cardiac resynchronization therapy. *Clin Cardiol.* 2017 May;40(5):292-9. doi: 10.1002/clc.22658. PMID: 28294364. - **Does not address outcome of interest**
595. Ghani A, Delnoy P, Adiyaman A, et al. Septal rebound stretch as predictor of echocardiographic response to cardiac resynchronization therapy. *Int J Cardiol Heart Vasc.* 2015 Jun 1;7:22-7. doi: 10.1016/j.ijcha.2015.02.004. PMID: 28785641. - **Addresses only effectiveness, not an RCT**
596. Ghani A, Delnoy PP, Ottervanger JP, et al. Apical rocking is predictive of response to cardiac resynchronization therapy. *Int J Cardiovasc Imaging.* 2015 Apr;31(4):717-25. doi: 10.1007/s10554-015-0607-0. PMID: 25651877. - **Does not address outcome of interest**
597. Ghani A, Delnoy PP, Ottervanger JP, et al. Are changes in the extent of left ventricular dyssynchrony as assessed by speckle tracking associated with response to cardiac resynchronization therapy? *Int J Cardiovasc Imaging.* 2016 Apr;32(4):553-61. doi: 10.1007/s10554-015-0809-5.

- PMID: 26585749. - **Addresses only effectiveness, not an RCT**
598. Ghani A, Delnoy PP, Ottervanger JP, et al. Association of apical rocking with long-term major adverse cardiac events in patients undergoing cardiac resynchronization therapy. *Eur Heart J Cardiovasc Imaging*. 2016 Feb;17(2):146-53. doi: 10.1093/ehjci/jev236. PMID: 26453544. - **Does not address outcome of interest**
599. Ghani A, Delnoy PP, Smit JJ, et al. Association of apical rocking with super-response to cardiac resynchronisation therapy. *Neth Heart J*. 2016 Jan;24(1):39-46. doi: 10.1007/s12471-015-0768-4. PMID: 26649435. - **Addresses only effectiveness, not an RCT**
600. Ghotbi AA, Sander M, Kober L, et al. Optimal Cardiac Resynchronization Therapy Pacing Rate in Non-Ischemic Heart Failure Patients: A Randomized Crossover Pilot Trial. *PLoS One*. 2015;10(9):e0138124. doi: 10.1371/journal.pone.0138124. PMID: 26382243. - **Addresses only effectiveness, not an RCT**
601. Gierula J, Cubbon RM, Jamil HA, et al. Cardiac resynchronization therapy in pacemaker-dependent patients with left ventricular dysfunction. *Europace*. 2013;15(11):1609-14. doi: 10.1093/europace/eut148. - **Does not address outcome of interest**
602. Gierula J, Cubbon RM, Jamil HA, et al. Cardiac resynchronization therapy in pacemaker-dependent patients with left ventricular dysfunction. *Europace*. 2013 2013 Nov;15(11):1609-14. - **Other: not population of interest**
603. Gierula J, Cubbon RM, Jamil HA, et al. Patients with long-term permanent pacemakers have a high prevalence of left ventricular dysfunction. *J Cardiovasc Med (Hagerstown)*. 2015 Nov;16(11):743-50. doi: 10.2459/jcm.0000000000000117. PMID: 24979115. - **Does not evaluate a CRT**
604. Gilewski W, Blazejewski J, Karasek D, et al. Are changes in heart rate, observed during dobutamine stress echocardiography, associated with a response to cardiac resynchronisation therapy in patients with severe heart failure? Results of a multicentre ViaCRT study. *Kardiol Pol*. 2018;76(3):611-7. doi: 10.5603/KP.a2017.0261. PMID: 29297189. - **Addresses only effectiveness, not an RCT**
605. Gillam MH, Pratt NL, Inacio MCS, et al. Rehospitalizations for complications and mortality following pacemaker implantation: A retrospective cohort study in an older population. *Clin Cardiol*. 2018;41(11):1480-6. doi: 10.1002/clc.23091. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
606. Gillebert C, Marynissen T, Janssen R, et al. How to choose between a pacemaker or defibrillator for resynchronization therapy? *Acta Cardiol*. 2014 Oct;69(5):483-9. doi: 10.2143/ac.69.5.3044874. PMID: 25638835. - **Addresses only effectiveness, not an RCT**

607. Gilliam FRr, Kaplan AJ, Black J, et al. Changes in heart rate variability, quality of life, and activity in cardiac resynchronization therapy patients: results of the HF-HRV registry. *Pacing Clin Electrophysiol.* 2007 2007 Jan;30(1):56-64. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
608. Gilligan DM, Sargent D, Ponnathpur V, et al. Echocardiographic atrioventricular interval optimization in patients with dual-chamber pacemakers and symptomatic left ventricular systolic dysfunction. *Am J Cardiol.* 2003 2003 Mar 1;91(5):629-31 - **Not relevant to Key Questions**
609. Gillis AM, Kerr CR, Philippon F, et al. Impact of Cardiac Resynchronization Therapy on Hospitalizations in the Resynchronization-Defibrillation for Ambulatory Heart Failure Trial. *Circulation.* 2014 2014 Mar 7. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
610. Gimelli A, Stanislao M, Valle G, et al. Volume overload modulates effects of cardiac resynchronization therapy independently of myocardial reperfusion: results of the RESYNC study. *J Cardiovasc Med (Hagerstown).* 2007 2007 Aug;8(8):575-81 - **Not relevant to Key Questions**
611. Goetze S, Zhang Y, An Q, et al. Ambulatory respiratory rate trends identify patients at higher risk of worsening heart failure in implantable cardioverter defibrillator and biventricular device recipients: a novel ambulatory parameter to optimize heart failure management. *J Interv Card Electrophysiol.* 2015 Jun;43(1):21-9. doi: 10.1007/s10840-015-9983-6. PMID: 25863797. - **Does not address outcome of interest**
612. Gold MR, Daubert C, Abraham WT, et al. Continued remodeling despite cardiac resynchronization therapy in mildly symptomatic heart failure identifies subjects at increased mortality: long term follow-up results from reverse. *Circulation.* 2014;130 PMID: CN-01056054. – **Not full report**
613. Gold MR, Daubert C, Abraham WT, et al. The effect of reverse remodeling on long-term survival in mildly symptomatic patients with heart failure receiving cardiac resynchronization therapy: results of the REVERSE study. *Heart Rhythm.* 2015 Mar;12(3):524-30. doi: 10.1016/j.hrthm.2014.11.014. PMID: 25460860. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
614. Gold MR, Daubert JC, Abraham WT, et al. Implantable defibrillators improve survival in patients with mildly symptomatic heart failure receiving cardiac resynchronization therapy: analysis of the long-term follow-up of remodeling in systolic left ventricular dysfunction (REVERSE). *Circ Arrhythm Electrophysiol.* 2013 2013 Dec;6(6):1163-8. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
615. Gold MR, Linde C, Abraham WT, et al. The impact of cardiac

- resynchronization therapy on the incidence of ventricular arrhythmias in mild heart failure. *Heart Rhythm*. 2011 2011 May;8(5):679-84 - **Not relevant to Key Questions**
616. Gold MR, Linde C, Abraham WT, et al. The impact of cardiac resynchronization therapy on the incidence of ventricular arrhythmias in mild heart failure. *Heart Rhythm*. 2011 2011 May;8(5):679-84. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
617. Gold MR, Padhiar A, Mealing S, et al. Long-Term Extrapolation of Clinical Benefits Among Patients With Mild Heart Failure Receiving Cardiac Resynchronization Therapy: Analysis of the 5-Year Follow-Up From the REVERSE Study. *JACC Heart Fail*. 2015 Sep;3(9):691-700. doi: 10.1016/j.jchf.2015.05.005. PMID: 26277764. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
618. Gold MR, Singh JP, Ellenbogen KA, et al. Interventricular Electrical Delay Is Predictive of Response to Cardiac Resynchronization Therapy. *JACC Clin Electrophysiol*. 2016 Aug;2(4):438-47. doi: 10.1016/j.jacep.2016.02.018. PMID: 29759863. - **Does not address outcome of interest**
619. Gold MR, Thebault C, Linde C, et al. Effect of QRS duration and morphology on cardiac resynchronization therapy outcomes in mild heart failure: results from the Resynchronization Reverses Remodeling in Systolic Left Ventricular Dysfunction (REVERSE) study. *Circulation*. 2012 2012 Aug 14;126(7):822-9. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
620. Gold MR, Yu Y, Singh JP, et al. Effect of Interventricular Electrical Delay on Atrioventricular Optimization for Cardiac Resynchronization Therapy. *Circ Arrhythm Electrophysiol*. 2018;11(8):e006055. doi: 10.1161/circep.117.006055. - **Addresses effectiveness questions only and is not RCT**
621. Gold MR, Yu Y, Wold N, et al. The role of interventricular conduction delay to predict clinical response with cardiac resynchronization therapy. *Heart Rhythm*. 2017 Dec;14(12):1748-55. doi: 10.1016/j.hrthm.2017.10.016. PMID: 29195547. - **Addresses only effectiveness, not an RCT**
622. Gold MR, Yu Y, Wold N, et al. The role of interventricular delay and electrical remodeling to predict clinical outcomes with cardiac resynchronization therapy. *Europace*. Conference: european heart rhythm association EUROPACE-CARDIOSTIM 2017 congress. Austria. 2017;19(Supplement 3):iii329. PMID: CN-01421481. - **Does not address outcome of interest**
623. Goldstein SA, Mentz RJ, Hellkamp AS, et al. Timing of cardiac resynchronization therapy device implantation in heart failure patients and its association with outcomes. *Clin Cardiol*. 2019;42(2):256-63. doi: 10.1002/clc.23135. - **Population**

inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range

624. Gopinathannair R, Birks EJ, Trivedi JR, et al. Impact of cardiac resynchronization therapy on clinical outcomes in patients with continuous-flow left ventricular assist devices. *J Card Fail.* 2015 Mar;21(3):226-32. doi: 10.1016/j.cardfail.2014.12.006. PMID: 25528199. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
625. Gopinathannair R, Roukoz H, Bhan A, et al. Cardiac resynchronization therapy versus ICD on clinical outcomes in continuous flow LVAD recipients: a multicenter analysis. *Heart rhythm. Conference: 38th annual scientific sessions of the heart rhythm society, heart rhythm 2017.* United states. 2017;14(5 Supplement 1):S84. PMID: CN-01400166. – **Not full report**
626. Gopinathannair R, Roukoz H, Bhan A, et al. Cardiac Resynchronization Therapy and Clinical Outcomes in Continuous Flow Left Ventricular Assist Device Recipients. *J Am Heart Assoc.* 2018 Jun 15;7(12)doi: 10.1161/jaha.118.009091. PMID: 29907652. - **Does not address outcome of interest**
627. Gorcsan J, 3rd, Anderson CP, Tayal B, et al. Systolic Stretch Characterizes the Electromechanical Substrate Responsive to Cardiac Resynchronization Therapy. *JACC Cardiovasc Imaging.* 2018 Sep 12doi: 10.1016/j.jcmg.2018.07.013. PMID: 30219394. - **Addresses only effectiveness, not an RCT**
628. Gorcsan J, 3rd, Sogaard P, Bax JJ, et al. Association of persistent or worsened echocardiographic dyssynchrony with unfavourable clinical outcomes in heart failure patients with narrow QRS width: a subgroup analysis of the EchoCRT trial. *Eur Heart J.* 2016 Jan 1;37(1):49-59. doi: 10.1093/eurheartj/ehv418. PMID: 26321238. - **Does not address outcome of interest**
629. Gorcsan J, Anderson CP, Tayal B, et al. Systolic stretch improves prediction of response to cardiac resynchronization therapy in patients with QRS width 120-149ms or non-left bundle branch block: an adaptive CRT trial substudy. *Circulation. Conference: resuscitation science symposium, res 2017.* United states. 2017;136(Supplement 1) (no pagination) PMID: CN-01438656. - **Does not address outcome of interest**
630. Gorcsan Jr, Oyenuga O, Habib PJ, et al. Relationship of echocardiographic dyssynchrony to long-term survival after cardiac resynchronization therapy. *Circulation.* 2010 2010 Nov 9;122(19):1910-8 - **Not relevant to Key Questions**
631. Goscinska-Bis K, Bis J, Krejca M, et al. Totally epicardial cardiac resynchronization therapy system implantation in patients with heart failure undergoing CABG. *Eur J Heart Fail.* 2008 2008 May;10(5):498-506. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**

632. Gradaus R, Stuckenberg V, Loher A, et al. Diastolic filling pattern and left ventricular diameter predict response and prognosis after cardiac resynchronization therapy. *Heart*. 2008 Aug;94(8):1026-31. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
633. Grandin EW, Wand A, Zamani P, et al. Relation of Body Mass Index to Long-Term Survival After Cardiac Resynchronization Therapy. *Am J Cardiol*. 2016 Dec 15;118(12):1861-7. doi: 10.1016/j.amjcard.2016.08.079. PMID: 27823599. - **Does not address outcome of interest**
634. Greenberg JM, Leon AR, Book WM, et al. Benefits of cardiac resynchronization therapy in outpatients with indicators for heart transplantation. *J Heart Lung Transplant*. 2003 Oct;22(10):1134-40. - **Addresses only effectiveness, not an RCT**
635. Greenlee RT, Go AS, Peterson PN, et al. Device Therapies Among Patients Receiving Primary Prevention Implantable Cardioverter-Defibrillators in the Cardiovascular Research Network. *J Am Heart Assoc*. 2018 Mar 26;7(7)doi: 10.1161/jaha.117.008292. PMID: 29581222. - **Addresses only effectiveness, not an RCT**
636. Greenspon AJ, Patel JD, Lau E, et al. 16-year trends in the infection burden for pacemakers and implantable cardioverter-defibrillators in the United States 1993 to 2008. *J Am Coll Cardiol*. 2011 Aug 30;58(10):1001-6. - **Does not evaluate a CRT**
637. Grimm W, Sharkova J, Funck R, et al. How many patients with dilated cardiomyopathy may potentially benefit from cardiac resynchronization therapy? *Pacing Clin Electrophysiol*. 2003 Jan;26(1 Pt 2):155-7. - **Does not evaluate a CRT**
638. Grimm W, Sharkova J, Funck R, et al. How many patients with dilated cardiomyopathy may potentially benefit from cardiac resynchronization therapy? *Pacing Clin Electrophysiol*. 2003 Jan;26(1 Pt 2):155-7. - **Not relevant to Key Questions**
639. Gronda E, Genovese S, Padeletti L, et al. Renal function impairment predicts mortality in patients with chronic heart failure treated with resynchronization therapy. *Cardiol J*. 2015;22(4):459-66. doi: 10.5603/CJ.a2015.0019. PMID: 26325259. - **Addresses only effectiveness, not an RCT**
640. Grosu A, Senni M, Iacovoni A, et al. Cardiac resynchronization in combination with beta blocker treatment in advanced chronic heart failure (CARIBE-HF): the results of the CARIBE-HF study. *Acta Cardiol*. 2011 Oct;66(5):573-80. - **Not relevant to Key Questions**
641. Grupper A, Killu AM, Friedman PA, et al. Effects of tricuspid valve regurgitation on outcome in patients with cardiac resynchronization therapy. *Am J Cardiol*. 2015 Mar 15;115(6):783-9. doi: 10.1016/j.amjcard.2014.12.046. PMID: 25638518. - **Addresses only effectiveness, not an RCT**

642. Gu M, Jin H, Hua W, et al. Clinical outcome of cardiac resynchronization therapy in dilated-phase hypertrophic cardiomyopathy. *J Geriatr Cardiol*. 2017 Apr;14(4):238-44. doi: 10.11909/j.issn.1671-5411.2017.04.002. PMID: 28663761. - **Does not address outcome of interest**
643. Guerra F, Palmisano P, Dell'era G, et al. Cardiac resynchronization therapy reduces electrical storm incidence over a 3-year follow-up. *European heart journal*. Conference: european society of cardiology, ESC congress 2017. Spain. 2017;38(Supplement 1):1168. doi: 10.1093/eurheartj/ehx502.P5479. PMID: CN-01468697. - **Does not address outcome of interest**
644. Guerra F, Palmisano P, Dell'Era G, et al. Cardiac resynchronization therapy and electrical storm: results of the OBSERVational registry on long-term outcome of ICD patients (OBSERVO-ICD). *Europace*. 2018 Jun 1;20(6):979-85. doi: 10.1093/europace/eux166. PMID: 28595339. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
645. Guha K, Mantziari L, Sharma R, et al. A reduction in total isovolumic time with cardiac resynchronisation therapy is a predictor of clinical outcomes. *Int J Cardiol*. 2013 2013 Sep 20;168(1):382-7 - **Not relevant to Key Questions**
646. Guha K, Mantziari L, Sharma R, et al. A reduction in total isovolumic time with cardiac resynchronisation therapy is a predictor of clinical outcomes. *Int J Cardiol*. 2013 2013 Sep 20;168(1):382-7. - **Addresses only effectiveness, not an RCT**
647. Guha K, Spiesshofer J, Hartley A, et al. The prognostic significance of serum sodium in a population undergoing cardiac resynchronisation therapy. *Indian Heart J*. 2017 Sep - Oct;69(5):613-8. doi: 10.1016/j.ihj.2017.01.019. PMID: 29054185. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
648. Gulya MO, Lishmanov YB, Zavadovsky KV, et al. Metabolism of fatty acids in left ventricle myocardium and the efficacy prognosis of cardio-resynchronizing therapy in dilated cardiomyopathy patients. *Russian Journal of Cardiology*. 2014;113(9):61-7. - **Not in English**
649. Gunten SV, Theuns DA, Kuhne M, et al. Predictors for early mortality and arrhythmic events in patients with a CRT-D: A two center cohort study. *Cardiol J*. 2018 Nov 28doi: 10.5603/CJ.a2018.0144. PMID: 30484267. - **Other: predictors**
650. Guo T, Li R, Zhang L, et al. Biventricular pacing with ventricular fusion by intrinsic activation in cardiac resynchronization therapy. *Int Heart J*. 2015 May 13;56(3):293-7. doi: 10.1536/ihj.14-260. PMID: 25912899. - **Does not address outcome of interest**
651. Gwag HB, Chun KJ, Hwang JK, et al. Comparison of De Novo versus Upgrade Cardiac Resynchronization Therapy; Focused on the Upgrade for Pacing-Induced

- Cardiomyopathy. *Yonsei Med J*. 2017 Jul;58(4):703-9. doi: 10.3349/ymj.2017.58.4.703. PMID: 28540981. - **Does not address outcome of interest**
652. Hadjis A, AlTurki A, Proietti R, et al. Predicting response to cardiac resynchronization therapy: Use of strict left bundle branch block criteria. *PACE - Pacing and Clinical Electrophysiology*. 2019;42(4):431-8. doi: 10.1111/pace.13638. - **Addresses effectiveness questions only and is not RCT**
653. Hamaoka M, Mine T, Kodani T, et al. Hemodynamic effects of Purkinje potential pacing in the left ventricular endocardium in patients with advanced heart failure. *J Arrhythm*. 2015 Dec;31(6):371-5. doi: 10.1016/j.joa.2015.06.005. PMID: 26702317. - **Addresses only effectiveness, not an RCT**
654. Hamdan MH, Barbera S, Kowal RC, et al. Effects of resynchronization therapy on sympathetic activity in patients with depressed ejection fraction and intraventricular conduction delay due to ischemic or idiopathic dilated cardiomyopathy. *Am J Cardiol*. 2002 2002 May 1;89(9):1047-51 - **Not relevant to Key Questions**
655. Hamdan MH, Zagrodzky JD, Joglar JA, et al. Biventricular pacing decreases sympathetic activity compared with right ventricular pacing in patients with depressed ejection fraction. *Circulation*. 2000 2000 Aug 29;102(9):1027-32.- **Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
656. Hansen C, Loges C, Birkenhauer F, et al. Investigation on routine follow-up in heart failure patients with remotely monitored implanted cardioverter defibrillators systems. *Europace*. 2015;17:iii228. doi: 10.1093/europace/euv178. PMID: CN-01131342. - **Not full report**
657. Hansen PB, Sommer A, Norgaard BL, et al. Left atrial size and function as assessed by computed tomography in cardiac resynchronization therapy: Association to echocardiographic and clinical outcome. *Int J Cardiovasc Imaging*. 2017 Jun;33(6):917-25. doi: 10.1007/s10554-017-1070-x. PMID: 28124231. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
658. Hansky B, Vogt J, Zittermann A, et al. Cardiac resynchronization therapy: long-term alternative to cardiac transplantation? *Ann Thorac Surg*. 2009 2009 Feb;87(2):432-8 - **Not relevant to Key Questions**
659. Hansky B, Vogt J, Zittermann A, et al. Cardiac resynchronization therapy: long-term alternative to cardiac transplantation? *Ann Thorac Surg*. 2009 2009 Feb;87(2):432-8. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
660. Harris S, Tepper D, Ip R. Comparison of the Effects of Cardiac Resynchronization Therapy in Patients With Class II vs Class III and IV Heart Failure (From the

- InSync/InSync ICD Italian Registry). *Congestive Heart Fail.* 2013 2013;14(2). – **Not full report**
661. Harris S, Tepper D, Ip R. Comparison of the Effects of Cardiac Resynchronization Therapy in Patients With Class II vs Class III and IV Heart Failure (From the InSync/InSync ICD Italian Registry). *Congestive Heart Fail.* 2013 2013;14(2). - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
662. Hartlage GR, Suever JD, Clement-Guinaudeau S, et al. Prediction of response to cardiac resynchronization therapy using left ventricular pacing lead position and cardiovascular magnetic resonance derived wall motion patterns: a prospective cohort study. *J Cardiovasc Magn Reson.* 2015 Jul 14;17:57. doi: 10.1186/s12968-015-0158-5. PMID: 26170046. - **Addresses only effectiveness, not an RCT**
663. Hasselberg NE, Haugaa KH, Bernard A, et al. Left ventricular markers of mortality and ventricular arrhythmias in heart failure patients with cardiac resynchronization therapy. *Eur Heart J Cardiovasc Imaging.* 2016 Mar;17(3):343-50. doi: 10.1093/ehjci/jev173. PMID: 26164406. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
664. Hattori K, Maeda T, Masubuchi T, et al. Accuracy and Trending Ability of the Fourth-Generation FloTrac/Vigileo System in Patients With Low Cardiac Index. *J Cardiothorac Vasc Anesth.* 2017 Feb;31(1):99-104. doi: 10.1053/j.jvca.2016.06.016. PMID: 27612931. - **Does not address outcome of interest**
665. Hatzinikolaou-Kotsakou E, Reppas E, Kotsakou M, et al. Diastolic function, filling pressures in combination with B-type natriuretic peptide levels affect cardiac resynchronization therapy response in chronic heart failure patients. *European journal of heart failure.* Conference: heart failure 2017 and the 4th world congress on acute heart failure. France. 2017;19:456. doi: 10.1002/ejhf.833. PMID: CN-01376891. – **Not full report**
666. Haugaa KH, Marek JJ, Ahmed M, et al. Mechanical dyssynchrony after cardiac resynchronization therapy for severely symptomatic heart failure is associated with risk for ventricular arrhythmias. *Journal of the American Society of Echocardiography.* 2014;27(8):872-9. doi: 10.1016/j.echo.2014.04.001. -**Other: prior review**
667. Heidenreich PA, Tsai V, Bao H, et al. Does Age Influence Cardiac Resynchronization Therapy Use and Outcome? *JACC Heart Fail.* 2015 Jun;3(6):497-504. doi: 10.1016/j.jchf.2015.01.012. PMID: 25982109. - **Addresses only effectiveness, not an RCT**
668. Heist EK, Taub C, Fan D, et al. Usefulness of a novel "response score" to predict hemodynamic and clinical outcome from cardiac resynchronization therapy. *Am J Cardiol.* 2006 2006 Jun 15;97(12):1732-6 - **Not relevant to Key Questions**

669. Henneman MM, Chen J, Dibbets-Schneider P, et al. Can LV dyssynchrony as assessed with phase analysis on gated myocardial perfusion SPECT predict response to CRT? J Nucl Med. 2007 2007 Jul;48(7):1104-11 - **Not relevant to Key Questions**
670. Hernandez Madrid A, Escobar Cervantes C, Marin Marin I, et al. Cardiac resynchronization. Socioeconomic and health care impact. Mortality of procedure. Cost-benefit ratio. Impact on functional class/quality of life. Prognosis and follow-up: Resincronizacion cardiaca. Impacto socioeconomico sanitario. Mortalidad del procedimiento. Relacion coste-beneficio. Impacto en la clase funcional/calidad de vida. Pronostico y seguimiento. Invest. Cardiovasc. 2005 2005;8(2):135-50.-**Other: QRS and LVEF not specified**
671. Hernandez Madrid A, Matia Frances R, Moro C, et al. Cardiac resynchronization therapy: do patient selection and implant practice vary depending on the volume a center handles? Pacing Clin Electrophysiol. 2013 2013 Jul;36(7):863-71 - **Not relevant to Key Questions**
672. Herscovici R, Kutiyafa V, Barsheshet A, et al. Early intervention and long-term outcome with cardiac resynchronization therapy in patients without a history of advanced heart failure symptoms. Eur J Heart Fail. 2015 Sep;17(9):964-70. doi: 10.1002/ejhf.281. PMID: 25921965. - **Does not address outcome of interest**
673. Himmel F, Reppel M, Mortensen K, et al. A strategy to achieve CRT response in permanent atrial fibrillation without obligatory atrioventricular node ablation. Pacing Clin Electrophysiol. 2012 2012 Aug;35(8):943-7 - **Not relevant to Key Questions**
674. Himmel F, Reppel M, Mortensen K, et al. A strategy to achieve CRT response in permanent atrial fibrillation without obligatory atrioventricular node ablation. Pacing Clin Electrophysiol. 2012 2012 Aug;35(8):943-7. - **Addresses only effectiveness, not an RCT**
675. Hina K, Kawamura H, Murakami T, et al. Association of corrected QT dispersion with symptoms improvement in patients receiving cardiac resynchronization therapy. Heart Vessels. 2008 2008 Sep;23(5):325-33.-**Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
676. Hindricks G, Taborsky M, Glikson M, et al. Implant-based multiparameter telemonitoring of patients with heart failure (IN-TIME): a randomised controlled trial. Lancet. 2014 Aug 16;384(9943):583-90. doi: 10.1016/s0140-6736(14)61176-4. PMID: 25131977. - **Does not evaluate a CRT**
677. Hirschl DA, Jain VR, Spindola-Franco H, et al. Prevalence and characterization of asymptomatic pacemaker and ICD lead perforation on CT. Pacing Clin Electrophysiol.

- 2007 2007 Jan;30(1):28-32. - **Does not evaluate a CRT**
678. Hirschl DA, Jain VR, Spindola-Franco H, et al. Prevalence and characterization of asymptomatic pacemaker and ICD lead perforation on CT. *Pacing Clin Electrophysiol.* 2007 2007 Jan;30(1):28-32. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
679. Hitz L, Kuhne MS, Sticherling C, et al. Adjustments of heart failure medication after implantation of a cardiac resynchronization therapy defibrillator. *Minerva Med.* 2012 2012 Oct;103(5):361-7 - **Not relevant to Key Questions**
680. Hohnloser SH, Ikeda T, Cohen RJ. Evidence regarding clinical use of microvolt T-wave alternans. *Heart Rhythm.* 2009 2009 Mar;6(3 Suppl):S36-44. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
681. Hoke U, Auger D, Thijssen J, et al. Significant lead-induced tricuspid regurgitation is associated with poor prognosis at long-term follow-up. *Heart.* 2014 2014 Jan 21. - **Does not evaluate a CRT**
682. Hoke U, Khidir MJ, van der Geest RJ, et al. Relation of Myocardial Contrast-Enhanced T1 Mapping by Cardiac Magnetic Resonance to Left Ventricular Reverse Remodeling After Cardiac Resynchronization Therapy in Patients With Nonischemic Cardiomyopathy. *Am J Cardiol.* 2017 May 1;119(9):1456-62. doi: 10.1016/j.amjcard.2017.01.023. PMID: 28274575. - **Does not address outcome of interest**
683. Hoke U, Khidir MJ, van der Velde ET, et al. Cardiac Resynchronization Therapy in CKD Stage 4 Patients. *Clin J Am Soc Nephrol.* 2015 Oct 7;10(10):1740-8. doi: 10.2215/cjn.00620115. PMID: 26408549. - **Addresses only effectiveness, not an RCT**
684. Hoke U, Mertens B, Khidir MJH, et al. Usefulness of the CRT-SCORE for Shared Decision Making in Cardiac Resynchronization Therapy in Patients With a Left Ventricular Ejection Fraction of \leq 35. *Am J Cardiol.* 2017 Dec 1;120(11):2008-16. doi: 10.1016/j.amjcard.2017.08.019. PMID: 29031415. - **Does not address outcome of interest**
685. Hoke U, Thijssen J, van Bommel RJ, et al. Influence of diabetes on left ventricular systolic and diastolic function and on long-term outcome after cardiac resynchronization therapy. *Diabetes Care.* 2013 2013 Apr;36(4):985-91 - **Not relevant to Key Questions**
686. Höke U, Thijssen J, Van Bommel RJ, et al. Influence of diabetes on left ventricular systolic and diastolic function and on long-term outcome after cardiac resynchronization therapy. *Diabetes Care.* 2013;36(4):985-91. doi: 10.2337/dc12-1116. - **Does not address outcome of interest**
687. Holman WL, Kirklin JK, Naftel DC, et al. Infection after implantation of pulsatile mechanical circulatory support devices. *J. Thorac. Cardiovasc. Surg.* 2010

- 2010;139(6):1632-6.e2. - **Does not evaluate a CRT**
688. Holman WL, Kirklin JK, Naftel DC, et al. Infection after implantation of pulsatile mechanical circulatory support devices. *J. Thorac. Cardiovasc. Surg.* 2010;139(6):1632-6.e2. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
689. Holmqvist F, Hellkamp AS, Lee KL, et al. Adverse effects of first-degree AV-block in patients with sinus node dysfunction: data from the mode selection trial. *Pacing Clin Electrophysiol.* 2014 Sep;37(9):1111-9. doi: 10.1111/pace.12404. PMID: 24797760 - **Not relevant to Key Questions**
690. Holzmeister J, Abraham WT. Device therapy: Indications for ICD-CRT in mildly symptomatic heart failure. *Nat Rev Cardiol.* 2010 Jan;7(1):7-8. - **No original data**
691. Hoogslag GE, Hoke U, Thijssen J, et al. Clinical, echocardiographic, and neurohormonal response to cardiac resynchronization therapy: are they interchangeable? *Pacing Clin Electrophysiol.* 2013 Nov;36(11):1391-401. doi: 10.1111/pace.12214. PMID: 23826659. - **Addresses only effectiveness, not an RCT**
692. Hoppe UC, Freemantle N, Cleland JG, et al. Effect of cardiac resynchronization on morbidity and mortality of diabetic patients with severe heart failure. *Diabetes Care.* 2007 2007 Mar;30(3):722-4. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
693. Hosoda J, Ishikawa T, Matsumoto K, et al. Significance of change in serum bilirubin in predicting left ventricular reverse remodeling and outcomes in heart failure patients with cardiac resynchronization therapy. *J Cardiol.* 2017 Nov;70(5):416-9. doi: 10.1016/j.jjcc.2017.04.001. PMID: 28522137. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
694. Hosoda J, Ishikawa T, Matsushita K, et al. Impact of renal insufficiency on long-term clinical outcome in patients with heart failure treated by cardiac resynchronization therapy. *J Cardiol.* 2012 2012 Oct;60(4):301-5. - **Addresses only effectiveness, not an RCT**
695. Hosoda J, Ishikawa T, Matsushita K, et al. Impact of renal insufficiency on long-term clinical outcome in patients with heart failure treated by cardiac resynchronization therapy. *J Cardiol.* 2012 2012 Oct;60(4):301-5. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
696. Hosseini SM, Moazzami K, Rozen G, et al. Utilization and in-hospital complications of cardiac resynchronization therapy: trends in the United States from 2003 to 2013. *Eur Heart J.* 2017 Jul 14;38(27):2122-8. doi: 10.1093/eurheartj/ehx100. PMID: 28329322. - **Population inclusion criteria do not fall within the**

**QRS \geq 120ms and LVEF \leq 35%
range**

697. Hotta VT, Martinelli Filho M, Mady C, et al. Comparison between 2D and 3D echocardiography in the evaluation of reverse remodeling after CRT. *Arq Bras Cardiol.* 2011 Aug;97(2):111-21. - **Addresses only effectiveness, not an RCT**
698. Hotta VT, Martinelli Filho M, Mathias WJ, et al. New equation for prediction of reverse remodeling after cardiac resynchronization therapy. *Echocardiography.* 2012 Jul;29(6):678-87 - **Not relevant to Key Questions**
699. Hou PN, Tsai SC, Lin WY, et al. Relationship of quantitative parameters of myocardial perfusion SPECT and ventricular arrhythmia in patients receiving cardiac resynchronization therapy. *Ann Nucl Med.* 2015 Nov;29(9):772-8. doi: 10.1007/s12149-015-1007-1. PMID: 26194143. - **Addresses only effectiveness, not an RCT**
700. Hsu JC, Birnie D, Stadler RW, et al. Adaptive cardiac resynchronization therapy is associated with decreased risk of incident atrial fibrillation compared to standard biventricular pacing: A real-world analysis of 37,450 patients followed by remote monitoring. *Heart Rhythm.* 2019 May 16doi: 10.1016/j.hrthm.2019.05.012. PMID: 31102750. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
701. Hsu JC, Varosy PD, Bao H, et al. Cardiac perforation from implantable cardioverter-defibrillator lead placement: insights from the national cardiovascular data registry. *Circ Cardiovasc Qual Outcomes.* 2013 Sep 1;6(5):582-90 - **Not relevant to Key Questions**
702. Hua W, Chen K, Zhou X, et al. Cardiac resynchronization therapy reduces T-wave alternans in patients with heart failure. *Europace.* 2015 Feb;17(2):281-8. doi: 10.1093/europace/euu258. PMID: 25398405. - **Does not address outcome of interest**
703. Hua W, Wang J, Ding L, et al. Resynchronization therapy improved the clinical outcomes in pacemaker patients upgraded to biventricular devices. *Heart rhythm.* 2014;11(5 SUPPL. 1):S399. doi: 10.1016/j.hrthm.2014.03.033. - **Not full report**
704. Huang W, Su L, Wu S, et al. Benefits of Permanent His Bundle Pacing Combined With Atrioventricular Node Ablation in Atrial Fibrillation Patients With Heart Failure With Both Preserved and Reduced Left Ventricular Ejection Fraction. *J Am Heart Assoc.* 2017 Apr 1;6(4)doi: 10.1161/jaha.116.005309. PMID: 28365568. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
705. Huang W, Su L, Wu S, et al. Long-term outcomes of His bundle pacing in patients with heart failure with left bundle branch block. *Heart.* 2018 Aug 9doi: 10.1136/heartjnl-2018-313415. PMID: 30093543. - **Population inclusion criteria do**

**not fall within the QRS \geq 120ms
and LVEF \leq 35% range**

706. Hudak M, Kerekanic M, Misikova S, et al. The effectiveness of CRT on improvement of survival of heart failure patients in real life clinical settings. *Acta Cardiol.* 2017 Apr;72(2):180-7. doi: 10.1080/00015385.2017.1291179. PMID: 28597793. - **Addresses only effectiveness, not an RCT**
707. Hurlimann D, Schmidt S, Seifert B, et al. Outcome of super-responders to cardiac resynchronization therapy defined by endpoint-derived parameters of left ventricular remodeling: a two-center retrospective study. *Clin Res Cardiol.* 2015 Feb;104(2):136-44. doi: 10.1007/s00392-014-0763-6. PMID: 25301085 - **Not relevant to Key Questions**
708. Hurlimann D, Schmidt S, Seifert B, et al. Outcome of super-responders to cardiac resynchronization therapy defined by endpoint-derived parameters of left ventricular remodeling: a two-center retrospective study. *Clin Res Cardiol.* 2015 Feb;104(2):136-44. doi: 10.1007/s00392-014-0763-6. PMID: 25301085. - **Does not address outcome of interest**
709. Hurlimann D, Schmidt S, Seifert B, et al. Outcome of super-responders to cardiac resynchronization therapy defined by endpoint-derived parameters of left ventricular remodeling: a two-center retrospective study. *Clin Res Cardiol.* 2015 Feb;104(2):136-44. doi: 10.1007/s00392-014-0763-6. PMID: 25301085. - **Addresses only effectiveness, not an RCT**
710. Husaini M, Biton Y, Stair B, et al. Effectiveness of cardiac resynchronization therapy by the frequency of revascularization procedures in ischemic cardiomyopathy patients. *Cardiol J.* 2016;23(4):437-45. doi: 10.5603/CJ.a2016.0032. PMID: 27320956. - **Other: Outcomes are combined, cannot differentiate. Ex. HF or death, VT/VF/death**
711. Hwang JK, Gwag HB, Park KM, et al. Outcomes of cardiac resynchronization therapy in patients with atrial fibrillation accompanied by slow ventricular response. *PLoS One.* 2019;14(1)doi: 10.1371/journal.pone.0210603. - **Addresses effectiveness questions only and is not RCT**
712. Icen YK, Donmez Y, Koca H, et al. T wave positivity in lead aVR is associated with mortality in patients with cardiac resynchronization therapy. *J Interv Card Electrophysiol.* 2018 Oct;53(1):41-6. doi: 10.1007/s10840-018-0364-9. PMID: 29627955. - **Does not address outcome of interest**
713. İcen YK, Dönmez Y, Koca H, et al. T wave positivity in lead aVR is associated with mortality in patients with cardiac resynchronization therapy. *Journal of Interventional Cardiac Electrophysiology.* 2018;53(1):41-6. doi: 10.1007/s10840-018-0364-9. - **Does not address outcome of interest**
714. Ichibori H, Fukuzawa K, Kiuchi K, et al. Predictors and Clinical Outcomes of Transient Responders to Cardiac Resynchronization

- Therapy. Pacing Clin Electrophysiol. 2017 Mar;40(3):301-9. doi: 10.1111/pace.13023. PMID: 28083969. - **Does not address outcome of interest**
715. Igarashi M, Tada H, Yamasaki H, et al. Fragmented QRS Is a Novel Risk Factor for Ventricular Arrhythmic Events After Receiving Cardiac Resynchronization Therapy in Nonischemic Cardiomyopathy. J Cardiovasc Electrophysiol. 2017 Mar;28(3):327-35. doi: 10.1111/jce.13139. PMID: 27925329. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
716. Iglesias-Alvarez D, Rodriguez-Manero M, Garcia-Seara FJ, et al. Comparison and Validation of Recommended QT Interval Correction Formulas for Predicting Cardiac Arrhythmias in Patients With Advanced Heart Failure and Cardiac Resynchronization Devices. Am J Cardiol. 2017 Sep 15;120(6):959-65. doi: 10.1016/j.amjcard.2017.06.024. PMID: 28739032. - **Addresses only effectiveness, not an RCT**
717. Iiya M, Shimizu M, Fujii H, et al. True complete left bundle branch block reveals dyssynchrony evaluated by semiconductor single-photon emission computed tomography. J Arrhythm. 2019 Feb;35(1):70-8. doi: 10.1002/joa3.12148. PMID: 30805046. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
718. Iler MA, Hu T, Ayyagari S, et al. Prognostic value of electrocardiographic measurements before and after cardiac resynchronization device implantation in patients with heart failure due to ischemic or nonischemic cardiomyopathy. Am J Cardiol. 2008 2008 Feb 1;101(3):359-63 - **Not relevant to Key Questions**
719. Iler MA, Hu T, Ayyagari S, et al. Prognostic value of electrocardiographic measurements before and after cardiac resynchronization device implantation in patients with heart failure due to ischemic or nonischemic cardiomyopathy. Am J Cardiol. 2008 2008 Feb 1;101(3):359-63. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
720. Imamura T, Kinugawa K, Nitta D, et al. Complete left bundle branch block and smaller left atrium are predictors of response to cardiac resynchronization therapy in advanced heart failure. Circ J. 2015;79(11):2414-21. doi: 10.1253/circj.CJ-15-0769. PMID: 26376671. - **Does not address outcome of interest**
721. Imamura T, Kinugawa K, Nitta D, et al. Should cardiac resynchronization therapy be a rescue therapy for inotrope-dependent patients with advanced heart failure? J Card Fail. 2015 Jun;21(6):535-8. doi: 10.1016/j.cardfail.2015.04.009. PMID: 25930086. - **Does not address outcome of interest**

722. Imanishi J, Tanaka H, Matsumoto K, et al. Utility of combined assessment of baseline dyssynchrony and its acute improvement to predict long-term outcomes after cardiac resynchronization therapy. *Am J Cardiol.* 2012 2012 Dec 15;110(12):1814-9 - **Not relevant to Key Questions**
723. Inage T, Yoshida T, Hiraki T, et al. Chronic cardiac resynchronization therapy reverses cardiac remodelling and improves invasive haemodynamics of patients with severe heart failure on optimal medical treatment. *Europace.* 2008 2008 Mar;10(3):379-83 - **Not relevant to Key Questions**
724. Inage T, Yoshida T, Hiraki T, et al. Chronic cardiac resynchronization therapy reverses cardiac remodelling and improves invasive haemodynamics of patients with severe heart failure on optimal medical treatment. *Europace.* 2008 2008 Mar;10(3):379-83. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
725. Inoue N, Ishikawa T, Sumita S, et al. Long-term follow-up of atrioventricular delay optimization in patients with biventricular pacing. *Circ J.* 2005 2005 Feb;69(2):201-4. -**Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
726. Ioannou A, Papageorgiou N, Barber H, et al. Impact of an Age-Adjusted Co-morbidity Index on Survival of Patients With Heart Failure Implanted With Cardiac Resynchronization Therapy Devices. *Am J Cardiol.* 2017 Oct 1;120(7):1158-65. doi: 10.1016/j.amjcard.2017.06.056. PMID: 28784235. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
727. Iori M, Bottoni N, Quartieri F, et al. E/A ratio before cardiac resynchronization therapy predicts left ventricle reverse remodeling. *Minerva Cardioangiol.* 2014 Aug;62(4):305-9. PMID: 25012099. - **Does not address outcome of interest**
728. Ishibashi K, Kubo T, Kitabata H, et al. Improvement of cardiac function by increasing stimulus strength during left ventricular pacing in cardiac resynchronization therapy. *Int Heart J.* 2015;56(1):62-6. doi: 10.1536/ihj.14-128. PMID: 25503657. - **Does not address outcome of interest**
729. Ito T, Kizawa S, Nogi S, et al. Association between presystolic ventricular flash and left ventricular functional recovery after cardiac resynchronization therapy. *Echocardiography.* 2014 2014 Feb;31(2):149-54. - **Addresses only effectiveness, not an RCT**
730. Itoh M, Yoshida A, Fukuzawa K, et al. Time-dependent effect of cardiac resynchronization therapy on ventricular repolarization and ventricular arrhythmias. *Europace.* 2013;15(12):1798-804. doi: 10.1093/europace/eut145. -**Other: prior review**

731. Itoh M, Yoshida A, Takei A, et al. Electrical storm after cardiac resynchronization therapy suppressed by triple-site biventricular pacing and atrioventricular nodal ablation. *Heart Rhythm*. 2012 2012 Dec;9(12):2059-62. – **Single case study**
732. Izutani H, Quan KJ, Biblo LA, et al. Biventricular pacing for congestive heart failure: early experience in surgical epicardial versus coronary sinus lead placement. *Heart Surg Forum*. 2002 2002;6(1):E1-6; discussion E1-6 - **Not relevant to Key Questions**
733. Jackson T, Amraoui S, Sohal M, et al. The interaction of QRS duration with cardiac magnetic resonance derived scar and mechanical dyssynchrony in systolic heart failure: Implications for cardiac resynchronization therapy. *Int J Cardiol Heart Vasc*. 2018 Mar;18:81-5. doi: 10.1016/j.ijcha.2017.11.005. PMID: 29750182. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
734. Jackson T, Sohal M, Chen Z, et al. A U-shaped type II contraction pattern in patients with strict left bundle branch block predicts super-response to cardiac resynchronization therapy. *Heart Rhythm*. 2014 Oct;11(10):1790-7. doi: 10.1016/j.hrthm.2014.06.005. PMID: 24912138 - **Not relevant to Key Questions**
735. Jackson T, Sohal M, Chen Z, et al. A U-shaped type II contraction pattern in patients with strict left bundle branch block predicts super-response to cardiac resynchronization therapy. *Heart Rhythm*. 2014 Oct;11(10):1790-7. doi: 10.1016/j.hrthm.2014.06.005. PMID: 24912138. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
736. Jacobsson J, Borgquist R, Reitan C, et al. Usefulness of the Sum Absolute QRST Integral to Predict Outcomes in Patients Receiving Cardiac Resynchronization Therapy. *Am J Cardiol*. 2016 Aug 1;118(3):389-95. doi: 10.1016/j.amjcard.2016.05.017. PMID: 27265674. - **Addresses only effectiveness, not an RCT**
737. Jacobsson J, Platonov PG, Reitan C, et al. Atrial high-rate episodes predict clinical outcome in patients with cardiac resynchronization therapy. *Scand Cardiovasc J*. 2017 Apr;51(2):74-81. doi: 10.1080/14017431.2016.1260768. PMID: 27841021. - **Does not address outcome of interest**
738. Jacobsson J, Reitan C, Platonov PG, et al. Ventricular high-rate episodes predict increased mortality in heart failure patients treated with cardiac resynchronization therapy. *Scand Cardiovasc J*. 2015 Feb;49(1):20-6. doi: 10.3109/14017431.2015.1006245. PMID: 25658030. - **Addresses only effectiveness, not an RCT**
739. Jame S, Kutiyifa V, Aktas MK, et al. Bipolar left ventricular pacing is associated with significant reduction in heart failure or death in CRT-D patients with LBBB. *Heart Rhythm*. 2016 Jul;13(7):1468-74. doi: 10.1016/j.hrthm.2016.03.009. PMID: 26961303. -**Other: same**

patients included in the main study with 1820 subjects.

740. Jame S, Kutyla V, Polonsky B, et al. Predictive value of device-derived activity level for short-term outcomes in MADIT-CRT. *Heart Rhythm*. 2017 Jul;14(7):1081-6. doi: 10.1016/j.hrthm.2017.03.032. PMID: 28347835. - **Does not address outcome of interest**
741. James KB, Militello M, Barbara G, et al. Biventricular pacing for heart failure patients on inotropic support: a review of 38 consecutive cases. *Tex Heart Inst J*. 2006;33(1):19-22. - **Addresses only effectiveness, not an RCT**
742. Januszkiewicz L, Vegh E, Borgquist R, et al. Prognostic implication of baseline PR interval in cardiac resynchronization therapy recipients. *Heart Rhythm*. 2015 Nov;12(11):2256-62. doi: 10.1016/j.hrthm.2015.06.016. PMID: 26066291. - **Addresses only effectiveness, not an RCT**
743. Jastrzebski M, Baranchuk A, Fijorek K, et al. Cardiac resynchronization therapy-induced acute shortening of QRS duration predicts long-term mortality only in patients with left bundle branch block. *Europace*. 2019;21(2):281-9. doi: 10.1093/europace/euy254. - **Addresses effectiveness questions only and is not RCT**
744. Jastrzebski M, Kukla P, Kisiel R, et al. Comparison of four LBBB definitions for predicting mortality in patients receiving cardiac resynchronization therapy. *Ann Noninvasive Electrocardiol*. 2018 Sep;23(5):e12563. doi: 10.1111/anec.12563. PMID: 29806716. - **Other: does not address**
745. Jastrzebski M, Wiliński J, Fijorek K, et al. Mortality and morbidity in cardiac resynchronization patients: Impact of lead position, paced left ventricular QRS morphology and other characteristics on long-term outcome. *Europace*. 2013;15(2):258-65. doi: 10.1093/europace/eus340. - **Does not address outcome of interest**
746. Jaussaud J, Blanc P, Derval N, et al. Ventilatory response and peak circulatory power: new functional markers of response after cardiac resynchronization therapy. *Arch Cardiovasc Dis*. 2010 Mar;103(3):184-91 - **Not relevant to Key Questions**
747. Jedrzejczyk-Patej E, Kowalski O, Sredniawa B, et al. Trying to predict the unpredictable: Variations in device-based daily monitored diagnostic parameters can predict malignant arrhythmic events in patients undergoing cardiac resynchronization therapy. *Cardiol J*. 2014;21(4):405-12. doi: 10.5603/CJ.a2014.0022. PMID: 24671897. - **Other: prior review**
748. Jedrzejczyk-Patej E, Lenarczyk R, Mazurek M, et al. Can we rely on machines? Device-detected atrial high rates correspond well with atrial arrhythmias in cardiac resynchronization recipients. *Europace*. 2016 Mar;18(3):436-44. doi: 10.1093/europace/euv095. PMID: 26017467. - **Does not address outcome of interest**
749. Jedrzejczyk-Patej E, Mazurek M, Kowalski O, et al. Device-related

- infective endocarditis in cardiac resynchronization therapy recipients - Single center registry with over 2500 person-years follow up. *Int J Cardiol.* 2017 Jan 15;227:18-24. doi: 10.1016/j.ijcard.2016.11.029. PMID: 27846457. - **Other: QRS missing**
750. Jeevanantham V, Turagam M, Shanberg D, et al. Cardiac Resynchronization Therapy prevents progression of renal failure in heart failure patients. *Indian Pacing Electrophysiol J.* 2016 Jul - Aug;16(4):115-9. doi: 10.1016/j.ipej.2016.11.006. PMID: 27924757. - **Does not address outcome of interest**
751. Jimenez-Candil J, Morinigo JL, Hernandez J, et al. Fragmentation of the paced QRS complex: a marker of antitachycardia pacing effectiveness among ICD patients. *J Cardiovasc Electrophysiol.* 2014 Oct;25(10):1100-8. doi: 10.1111/jce.12451. PMID: 24816219. - **Does not evaluate a CRT**
752. Jin H, Gu M, Hua W, et al. Predictors of super-response to cardiac resynchronization therapy: the significance of heart failure medication, pre-implant left ventricular geometry and high percentage of biventricular pacing. *J Geriatr Cardiol.* 2017 Dec;14(12):737-42. doi: 10.11909/j.issn.1671-5411.2017.12.003. PMID: 29581712. - **Does not address outcome of interest**
753. Jin H, Hua W, Ding LG, et al. Cardiac resynchronization therapy improved the clinical outcomes in pacemaker patients upgraded to biventricular device. *J Geriatr Cardiol.* 2017 Oct;14(10):649-51. doi: 10.11909/j.issn.1671-5411.2017.10.006. PMID: 29238367. - **Does not address outcome of interest**
754. Jin H, Yang S, Hua W, et al. Significant mitral regurgitation as a predictor of long-term prognosis in patients receiving cardiac resynchronisation therapy. *Kardiol Pol.* 2018;76(6):987-92. doi: 10.5603/KP.a2018.0035. PMID: 29399763. - **Does not address outcome of interest**
755. Jones MA, Khiani R, Foley P, et al. Inter- and intravein differences in cardiac output with cardiac resynchronization pacing using a multipolar LV pacing lead. *Pacing Clin Electrophysiol.* 2015 Feb;38(2):267-74. doi: 10.1111/pace.12531. PMID: 25414088. - **Does not evaluate a CRT**
756. Jones S, Lumens J, Sohaib SMA, et al. Cardiac resynchronization therapy: mechanisms of action and scope for further improvement in cardiac function. *Europace.* 2017 Jul 1;19(7):1178-86. doi: 10.1093/europace/euw136. PMID: 27411361. - **Addresses only effectiveness, not an RCT**
757. Jprn U. Strategic Management to Optimize Response To Cardiac Resynchronization Therapy. [Http://www.who.int/trialsearch/trial2.aspx? Trialid=jprn-umin000033176](http://www.who.int/trialsearch/trial2.aspx?Trialid=jprn-umin000033176). 2018 PMID: CN-01910864. - **Not full report**
758. Kabutoya T, Imai Y, Yokoyama Y, et al. A larger vectorcardiographic QRS area is associated with left

- bundle branch block and good prognosis in patients with cardiac resynchronization therapy. *J Electrocardiol.* 2018;51(6):1099-102. doi: 10.1016/j.jelectrocard.2018.09.014. PMID: 30497738
759. Kalogeropoulos A, Savoye LP, Georgiopoulou V, et al. Long-term response of the left ventricle to cardiac resynchronization therapy: insights from standard and strain echocardiography. *Congest Heart Fail.* 2011 Mar-Apr;17(2):71-9 - **Not relevant to Key Questions**
760. Kalogeropoulos A, Savoye LP, Georgiopoulou V, et al. Long-term response of the left ventricle to cardiac resynchronization therapy: insights from standard and strain echocardiography. *Congest Heart Fail.* 2011 Mar-Apr;17(2):71-9. - **Addresses only effectiveness, not an RCT**
761. Kalscheur MM, Kipp RT, Tattersall MC, et al. Machine Learning Algorithm Predicts Cardiac Resynchronization Therapy Outcomes: Lessons From the COMPANION Trial. *Circ Arrhythm Electrophysiol.* 2018 Jan;11(1):e005499. doi: 10.1161/circep.117.005499. PMID: 29326129. - **Does not address outcome of interest**
762. Kamioka M, Suzuki H, Yamada S, et al. High sensitivity C-reactive protein predicts nonresponders and cardiac deaths in severe heart failure patients after CRT implantation. *Int Heart J.* 2012;53(5):306-12 - **Not relevant to Key Questions**
763. Kamioka M, Suzuki H, Yamada S, et al. High sensitivity C-reactive protein predicts nonresponders and cardiac deaths in severe heart failure patients after CRT implantation. *Int Heart J.* 2012;53(5):306-12. - **Addresses only effectiveness, not an RCT**
764. Kamireddy S, Agarwal SK, Adelstein E, et al. Correlation of electrical and mechanical reverse remodeling after cardiac resynchronization therapy. *Ann Noninvasive Electrocardiol.* 2009 Apr;14(2):153-7 - **Not relevant to Key Questions**
765. Kamireddy S, Agarwal SK, Adelstein E, et al. Correlation of electrical and mechanical reverse remodeling after cardiac resynchronization therapy. *Ann Noninvasive Electrocardiol.* 2009 Apr;14(2):153-7. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
766. Kamiyama Y, Suzuki H, Yamada S, et al. Serum phosphate levels reflect responses to cardiac resynchronization therapy in chronic heart failure patients. *J Arrhythm.* 2015 Feb;31(1):38-42. doi: 10.1016/j.joa.2014.06.006. PMID: 26336522. - **Does not address outcome of interest**
767. Kandala J, Upadhyay GA, Altman RK, et al. Electrical delay in apically positioned left ventricular leads and clinical outcome after cardiac resynchronization therapy. *J Cardiovasc Electrophysiol.* 2013 Feb;24(2):182-7 - **Not relevant to Key Questions**

768. Kandala J, Upadhyay GA, Altman RK, et al. Electrical delay in apically positioned left ventricular leads and clinical outcome after cardiac resynchronization therapy. *J Cardiovasc Electrophysiol*. 2013 Feb;24(2):182-7. - **Addresses only effectiveness, not an RCT**
769. Kaneshiro T, Suzuki H, Yamada S, et al. Intrathoracic impedance changes reflect reverse left ventricular remodeling in response to cardiac resynchronization therapy in chronic heart failure patients. *Int Heart J*. 2012 2012;53(4):249-52. - **Addresses only effectiveness, not an RCT**
770. Kang SJ, Song JK, Yang HS, et al. Systolic and diastolic regional myocardial motion of pacing-induced versus idiopathic left bundle branch block with and without left ventricular dysfunction. *Am J Cardiol*. 2004 2004 May 15;93(10):1243-6. - **Does not evaluate a CRT**
771. Kang SJ, Song JK, Yang HS, et al. Systolic and diastolic regional myocardial motion of pacing-induced versus idiopathic left bundle branch block with and without left ventricular dysfunction. *Am J Cardiol*. 2004 2004 May 15;93(10):1243-6 - **Not relevant to Key Questions**
772. Kang Y, Cheng L, Cui J, et al. A new score system for predicting response to cardiac resynchronization therapy. *Cardiol J*. 2015;22(2):179-87. doi: 10.5603/CJ.a2014.0089. PMID: 25428735. - **Addresses only effectiveness, not an RCT**
773. Kanzaki H, Satomi K, Noda T, et al. Comparison of the acute effects of right ventricular apical pacing and biventricular pacing in patients with heart failure. *Intern Med*. 2015;54(11):1329-35. doi: 10.2169/internalmedicine.54.3081. PMID: 26027982. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
774. Kapa S, Curwin JH, Coyne RF, et al. Inappropriate defibrillator shocks from depolarization--repolarization mismatch in a patient with hypertrophy cardiomyopathy. *Pacing Clin Electrophysiol*. 2007 2007 Nov;30(11):1408-11. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
775. Kapetanakis S, Bhan A, Murgatroyd F, et al. Real-time 3D echo in patient selection for cardiac resynchronization therapy. *JACC Cardiovasc Imaging*. 2011 2011 Jan;4(1):16-26. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
776. Kapetanakis S, Kearney MT, Siva A, et al. Real-time three-dimensional echocardiography: a novel technique to quantify global left ventricular mechanical dyssynchrony. *Circulation*. 2005 2005 Aug 16;112(7):992-1000 - **Not relevant to Key Questions**
777. Karaca O, Cakal B, Omaygenc MO, et al. Native Electrocardiographic QRS Duration after Cardiac Resynchronization Therapy: The Impact on Clinical Outcomes and Prognosis. *J Card Fail*. 2016 Oct;22(10):772-80. doi:

- 10.1016/j.cardfail.2016.04.001.
PMID: 27058406. - **Addresses only effectiveness, not an RCT**
778. Karaca O, Omaygenc MO, Cakal B, et al. Effect of QRS Narrowing After Cardiac Resynchronization Therapy on Functional Mitral Regurgitation in Patients With Systolic Heart Failure. *Am J Cardiol.* 2016 Feb 1;117(3):412-9. doi: 10.1016/j.amjcard.2015.11.010. PMID: 26721652. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
779. Karbasi Afshar R, Ramezani Binabaj M, Rezaee Zavareh MS, et al. Efficacy of cardiac resynchronization with defibrillator insertion in patients undergone coronary artery bypass graft: a cohort study of cardiac function. *Ann Card Anaesth.* 2015 Jan-Mar;18(1):34-8. doi: 10.4103/0971-9784.148319. PMID: 25566709. - **Addresses only effectiveness, not an RCT**
780. Kashtanova SY, Mironova NA, Shitov VN, et al. Role of electrocardiographic and echocardiographic types of left bundle branch block in prediction of response to cardiac resynchronization therapy. *Terapevticheskii arkhiv.* 2018;90(12):76-83. doi: 10.26442/00403660.2018.12.000012. - **Not in English**
781. Kato H, Shimano M, Sumi T, et al. Acute improvement of left ventricular relaxation as a predictor of volume reduction after cardiac resynchronization therapy: a pilot study assessing the value of left ventricular hemodynamic parameter. *Pacing Clin Electrophysiol.* 2014 Nov;37(11):1544-52. doi: 10.1111/pace.12478. PMID: 25113752. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
782. Kawaguchi M, Murabayashi T, Fetics BJ, et al. Quantitation of basal dyssynchrony and acute resynchronization from left or biventricular pacing by novel echo-contrast variability imaging. *J Am Coll Cardiol.* 2002 2002 Jun 19;39(12):2052-8 - **Not relevant to Key Questions**
783. Kawamura M, Arai S, Yoshikawa K, et al. Association left ventricular lead and ventricular arrhythmias after upgrade to cardiac resynchronization therapy in patients with implantable cardioverter defibrillators. *Clin Cardiol.* 2019doi: 10.1002/clc.23192. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
784. Kawata H, Erande A, Lafi O, et al. Occurrence, mortality and predictors of complicated cardiac perforation in patients with CRT-D: Based on the National Inpatient Sample registry. *Int J Cardiol.* 2019doi: 10.1016/j.ijcard.2019.05.018. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
785. Kaypakli O, Koc M, Gozubuyuk G, et al. High Left Ventricular Lead Sensing Delay Predicts QRS Narrowing and Good Response to Cardiac Resynchronization

- Therapy. Pacing Clin Electrophysiol. 2016 Dec;39(12):1317-26. doi: 10.1111/pace.12963. PMID: 27753447. - **Does not address outcome of interest**
786. Kazemisaeid A, Sardari A, Ejmalian G, et al. Predictors of response to cardiac resynchronization therapy in heart failure patients. Experimental and Clinical Cardiology. 2014;20(6):3982-90. - **Does not address outcome of interest**
787. Kazmierczak J, Peregud-Pogorzelska M, Goracy J, et al. Effect of cardiac resynchronisation therapy on coronary blood flow in patients with non-ischaemic dilated cardiomyopathy. Kardiol Pol. 2014;72(6):511-8. doi: 10.5603/KP.a2014.0019. PMID: 24526554. - **Does not address outcome of interest**
788. Kelarijani RB, Dadjoo Y, Chalian H, et al. Over-time mitral regurgitation changes following cardiac resynchronization therapy. Adv Med Sci. 2008 2008;53(1):94-8 - **Not relevant to Key Questions**
789. Kelarijani RB, Saleh DK, Chalian M, et al. Gender- and age-related outcomes of cardiac resynchronization therapy: a pilot observational study. Gend Med. 2008 2008 Dec;5(4):415-22.- **Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
790. Kelli HM, Merchant FM, Mengistu A, et al. Intermediate-term mortality and incidence of ICD therapy in octogenarians after cardiac resynchronization therapy. J Geriatr Cardiol. 2014 Sep;11(3):180-4. doi: 10.11909/j.issn.1671-5411.2014.03.014. PMID: 25278964. - **Other: prior review**
791. Kerekanic M, Hudak M, Misikova S, et al. The prognostic value of high sensitive cardiac troponin I in patients receiving cardiac resynchronisation therapy. Acta Cardiol. 2018 Apr;73(2):141-6. doi: 10.1080/00015385.2017.1351248. PMID: 29025373. - **Addresses only effectiveness, not an RCT**
792. Kerola T, Eranti A, Aro AL, et al. Risk Factors Associated With Atrioventricular Block. JAMA Netw Open. 2019 May 3;2(5):e194176. doi: 10.1001/jamanetworkopen.2019.4176. PMID: 31125096. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
793. Kerwin WF, Botvinick EH, O'Connell JW, et al. Ventricular contraction abnormalities in dilated cardiomyopathy: effect of biventricular pacing to correct interventricular dyssynchrony. J Am Coll Cardiol. 2000 2000 Apr;35(5):1221-7.- **Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
794. Khatib M, Tolosana JM, Trucco E, et al. EAARN score, a predictive score for mortality in patients receiving cardiac resynchronization therapy based on pre-implantation

- risk factors. *Eur J Heart Fail.* 2014 Jul;16(7):802-9. doi: 10.1002/ejhf.102. PMID: 24863467. - **Addresses only effectiveness, not an RCT**
795. Khazanie P, Hammill BG, Qualls LG, et al. Clinical effectiveness of cardiac resynchronization therapy versus medical therapy alone among patients with heart failure: analysis of the ICD Registry and ADHERE. *Circ Heart Fail.* 2014 Nov;7(6):926-34. doi: 10.1161/circheartfailure.113.000838. PMID: 25227768 - **Not relevant to Key Questions**
796. Khazanie P, Hammill BG, Qualls LG, et al. Clinical effectiveness of cardiac resynchronization therapy versus medical therapy alone among patients with heart failure: analysis of the ICD Registry and ADHERE. *Circ Heart Fail.* 2014 Nov;7(6):926-34. doi: 10.1161/circheartfailure.113.000838. PMID: 25227768. - **Addresses only effectiveness, not an RCT**
797. Khidir MJ, Delgado V, Ajmone Marsan N, et al. QRS duration versus morphology and survival after cardiac resynchronization therapy. *ESC Heart Fail.* 2017 Feb;4(1):23-30. doi: 10.1002/ehf2.12122. PMID: 28217309. - **Addresses only effectiveness, not an RCT**
798. Khidir MJH, Abou R, Yilmaz D, et al. Prognostic value of global longitudinal strain in heart failure patients treated with cardiac resynchronization therapy. *Heart Rhythm.* 2018 Oct;15(10):1533-9. doi: 10.1016/j.hrthm.2018.03.034. PMID: 29604420. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
799. Khurshid S, Obeng-Gyimah E, Supple GE, et al. Reversal of Pacing-Induced Cardiomyopathy Following Cardiac Resynchronization Therapy. *JACC Clin Electrophysiol.* 2018 Feb;4(2):168-77. doi: 10.1016/j.jacep.2017.10.002. PMID: 29749933. - **Does not address outcome of interest**
800. Kiani J, Agarwal SK, Kamireddy S, et al. Relationship of electromechanical remodeling to survival rates after cardiac resynchronization therapy. *Tex Heart Inst J.* 2013 2013;40(3):268-73 - **Not relevant to Key Questions**
801. Kiani J, Agarwal SK, Kamireddy S, et al. Relationship of electromechanical remodeling to survival rates: After cardiac resynchronization therapy. *Tex Heart Inst J.* 2013;40(3):268-73. - **Does not address outcome of interest**
802. Kiehl EL, Makki T, Kumar R, et al. Incidence and predictors of right ventricular pacing-induced cardiomyopathy in patients with complete atrioventricular block and preserved left ventricular systolic function. *Heart Rhythm.* 2016 Dec;13(12):2272-8. doi: 10.1016/j.hrthm.2016.09.027. PMID: 27855853. - **Does not address outcome of interest**
803. Kies P, Bax JJ, Molhoek SG, et al. Effect of cardiac resynchronization therapy on inducibility of ventricular tachyarrhythmias in cardiac arrest survivors with either ischemic or idiopathic dilated

- cardiomyopathy. Am J Cardiol. 2005 2005 May 1;95(9):1111-4.-
Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.
804. Kies P, Bax JJ, Molhoek SG, et al. Effect of left ventricular remodeling after cardiac resynchronization therapy on frequency of ventricular arrhythmias. Am J Cardiol. 2004 2004 Jul 1;94(1):130-2 - **Not relevant to Key Questions**
805. Kies P, Leclercq C, Bleeker GB, et al. Cardiac resynchronisation therapy in chronic atrial fibrillation: impact on left atrial size and reversal to sinus rhythm. Heart. 2006 2006 Apr;92(4):490-4 - **Not relevant to Key Questions**
806. Kies P, Leclercq C, Bleeker GB, et al. Cardiac resynchronisation therapy in chronic atrial fibrillation: impact on left atrial size and reversal to sinus rhythm. Heart. 2006 2006 Apr;92(4):490-4. - **Addresses only effectiveness, not an RCT**
807. Killu AM, Grupper A, Friedman PA, et al. Predictors and Outcomes of 'Super-Response' to Cardiac Resynchronization Therapy. J Card Fail. 2014 2014 Mar 10 - **Not relevant to Key Questions**
808. Killu AM, Grupper A, Friedman PA, et al. Predictors and outcomes of "super-response" to cardiac resynchronization therapy. J Card Fail. 2014;20(6):379-86. doi: 10.1016/j.cardfail.2014.03.001. PMID: 24632340. - **Addresses only effectiveness, not an RCT**
809. Killu AM, Grupper A, Friedman PA, et al. Predictors and Outcomes of 'Super-Response' to Cardiac Resynchronization Therapy. J Card Fail. 2014 2014 Mar 10. - **Addresses only effectiveness, not an RCT**
810. Killu AM, Grupper A, Friedman PA, et al. Predictors and Outcomes of 'Super-Response' to Cardiac Resynchronization Therapy. J Card Fail. 2014 2014 Mar 10. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
811. Killu AM, Mazo A, Grupper A, et al. Super-response to cardiac resynchronization therapy reduces appropriate implantable cardioverter defibrillator therapy. Europace. 2018;20(8):1303-11. doi: 10.1093/europace/eux235. - **Addresses effectiveness questions only and is not RCT**
812. Kim CH, Olson LJ, Shen WK, et al. Ventilatory gas exchange and early response to cardiac resynchronization therapy. J Heart Lung Transplant. 2015 Nov;34(11):1430-5. doi: 10.1016/j.healun.2015.05.016. PMID: 26163155. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
813. Kim WY, Sogaard P, Mortensen PT, et al. Three dimensional echocardiography documents haemodynamic improvement by biventricular pacing in patients with severe heart failure. Heart. 2001 2001 May;85(5):514-20.-**Other:**

- Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
814. Kimura S, Ito M, Chinushi M, et al. Preservation of renal function in response to cardiac resynchronization therapy. *Circ J*. 2008 2008 Nov;72(11):1794-9.- **Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
815. Kindermann M, Hennen B, Jung J, et al. Biventricular versus conventional right ventricular stimulation for patients with standard pacing indication and left ventricular dysfunction: the Homburg Biventricular Pacing Evaluation (HOBIPACE). *J Am Coll Cardiol*. 2006 2006 May 16;47(10):1927-37. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
816. King A. Heart failure: Cardiac device therapy in elderly patientsinsights from 'real world' practice. *Nat. Rev. Cardiol*. 2010 2010;7(7):357. – **No original data**
817. Kirn B, Jansen A, Bracke F, et al. Mechanical discoordination rather than dyssynchrony predicts reverse remodeling upon cardiac resynchronization. *Am J Physiol Heart Circ Physiol*. 2008 2008 Aug;295(2):H640-6.-**Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
818. Kirubakaran S, Ladwiniec A, Arujuna A, et al. Male gender and chronic obstructive pulmonary disease predict a poor clinical response in patients undergoing cardiac resynchronisation therapy. *Int J Clin Pract*. 2011 2011 Mar;65(3):281-8 - **Not relevant to Key Questions**
819. Kisiel R, Fijorek K, Moskal P, et al. New ECG markers for predicting long-term mortality and morbidity in patients receiving cardiac resynchronization therapy. *J Electrocardiol*. 2018 Jul - Aug;51(4):637-44. doi: 10.1016/j.jelectrocard.2018.04.007. PMID: 29997004. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
820. Kisiel R, Fijorek K, Moskal P, et al. True left bundle branch block and long-term mortality in cardiac resynchronisation therapy patients. *Kardiol Pol*. 2019;77(3):371-9. doi: 10.5603/KP.a2019.0032. - **Addresses effectiveness questions only and is not RCT**
821. Kisiel R, Fijorek K, Sondej T, et al. Risk stratification in patients with cardiac resynchronisation therapy: the AL-FINE CRT risk score. *Kardiol Pol*. 2018 Sep 25doi: 10.5603/KP.a2018.0152. PMID: 30251245. - **Addresses only effectiveness, not an RCT**
822. Kiuchi MG, Paz LMR, Chen S, et al. Influence of vitamin D on the

- percentage time of cardiac resynchronization in patients with heart failure, premature ventricular complexes, and chronic kidney disease. *IJC Metabolic and Endocrine*. 2017;15:6-9. doi: 10.1016/j.ijcme.2017.06.001. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
823. Kleijn SA, van Dijk J, de Cock CC, et al. Assessment of intraventricular mechanical dyssynchrony and prediction of response to cardiac resynchronization therapy: comparison between tissue Doppler imaging and real-time three-dimensional echocardiography. *J Am Soc Echocardiogr*. 2009 Sep;22(9):1047-54 - **Not relevant to Key Questions**
824. Klein HU. Preventive cardiac resynchronisation therapy. *Heart*. 2012 Mar;98(6):508-15. – **No original data**
825. Kloch Badelek M, Klocek M, Czarnecka D, et al. Impact of cardiac resynchronisation therapy on physical ability and quality of life in patients with chronic heart failure. *Kardiol Pol*. 2012;70(6):581-8. - **Addresses only effectiveness, not an RCT**
826. Kloosterman M, Rienstra M, Mulder BA, et al. Atrial reverse remodelling is associated with outcome of cardiac resynchronization therapy. *Europace*. 2016 Aug;18(8):1211-9. doi: 10.1093/europace/euv382. PMID: 26718536. - **Addresses only effectiveness, not an RCT**
827. Knackstedt C, Arndt M, Mischke K, et al. Depression, psychological distress, and quality of life in patients with cardioverter defibrillator with or without cardiac resynchronization therapy. *Heart Vessels*. 2013 Jun 4 - **Not relevant to Key Questions**
828. Knackstedt C, Arndt M, Mischke K, et al. Depression, psychological distress, and quality of life in patients with cardioverter defibrillator with or without cardiac resynchronization therapy. *Heart Vessels*. 2013 Jun 4. - **Addresses only effectiveness, not an RCT**
829. Knappe D, Pouleur AC, Shah AM, et al. Acute effects of withdrawal of cardiac resynchronization therapy on left and right ventricular function, dyssynchrony, and contractile function in patients with New York Heart Association functional class I/II heart failure: MADIT-CRT. *J Card Fail*. 2013 Mar;19(3):149-55 - **Not relevant to Key Questions**
830. Knebel F, Schattke S, Bondke H, et al. Implementation of seven echocardiographic parameters of myocardial asynchrony to improve the long-term response rate of cardiac resynchronization therapy (CRT). *Cardiovasc Ultrasound*. 2008;6:58 - **Not relevant to Key Questions**
831. Knuuti J, Sundell J, Naum A, et al. Assessment of right ventricular oxidative metabolism by PET in patients with idiopathic dilated cardiomyopathy undergoing cardiac resynchronisation therapy. *Eur. J. Nucl. Med. Mol. Imaging*. 2004;31(12):1592-8.-**Other: QRS duration**

832. Kobe J, Andresen D, Maier S, et al. Complications and 1-year benefit of cardiac resynchronization therapy in patients over 75 years of age - Insights from the German Device Registry. *Int J Cardiol.* 2017 Feb 1;228:784-9. doi: 10.1016/j.ijcard.2016.11.212. PMID: 27898337. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
833. Kobe J, Dechering DG, Rath B, et al. Prospective evaluation of electrocardiographic parameters in cardiac resynchronization therapy: detecting nonresponders by left ventricular pacing. *Heart Rhythm.* 2012 2012 Apr;9(4):499-504 - **Not relevant to Key Questions**
834. Kobe J, Wasmer K, Andresen D, et al. Impact of atrial fibrillation on early complications and one year-survival after cardioverter defibrillator implantation: results from the German DEVICE registry. *Int J Cardiol.* 2013 2013 Oct 9;168(4):4184-90. - **Does not evaluate a CRT**
835. Kobe J, Wasmer K, Andresen D, et al. Impact of atrial fibrillation on early complications and one year-survival after cardioverter defibrillator implantation: results from the German DEVICE registry. *Int J Cardiol.* 2013 2013 Oct 9;168(4):4184-90 - **Not relevant to Key Questions**
836. Köbe J, Wasmer K, Andresen D, et al. Impact of atrial fibrillation on early complications and one year-survival after cardioverter defibrillator implantation: Results from the German DEVICE registry. *Int J Cardiol.* 2013;168(4):4184-90. doi: 10.1016/j.ijcard.2013.07.110. - **Other: prior review**
837. Koc M, Kaypakli O, Gozubuyuk G, et al. Coronary sinus lead delay index for optimization of coronary sinus lead placement. *Ann Noninvasive Electrocardiol.* 2018 Jan;23(1)doi: 10.1111/anec.12454. PMID: 28557338. - **Does not address outcome of interest**
838. Kockova R, Sedlacek K, Wichterle D, et al. Cardiac resynchronization therapy guided by cardiac magnetic resonance imaging: A prospective, single-centre randomized study (CMR-CRT). *Int J Cardiol.* 2018 Nov 1;270:325-30. doi: 10.1016/j.ijcard.2018.06.009. PMID: 29908832. - **Does not address outcome of interest**
839. Konstantino Y, Iakobishvili Z, Arad O, et al. Urgent cardiac resynchronization therapy in patients with decompensated chronic heart failure receiving inotropic therapy. A case series. *Cardiology.* 2006 2006;106(1):59-62. - **Addresses only effectiveness, not an RCT**
840. Kostic T, Perisic Z, Milic D, et al. Long-term benefits of cardiac resynchronization therapy in heart failure patients. *HealthMED.* 2012 2012;6(12):4113-9. - **Addresses only effectiveness, not an RCT**
841. Kosztin A, Costa J, Moss AJ, et al. Clinical presentation at first heart failure hospitalization does not predict recurrent heart failure admission. *ESC Heart Fail.* 2017 Nov;4(4):520-6. doi: 10.1002/ehf2.12157. PMID: 28960867. - **Does not address outcome of interest**

842. Kosztin A, Kutuyifa V, Nagy VK, et al. Longer right to left ventricular activation delay at cardiac resynchronization therapy implantation is associated with improved clinical outcome in left bundle branch block patients. *Europace*. 2016 Apr;18(4):550-9. doi: 10.1093/europace/euv117. PMID: 26116830. - **Addresses only effectiveness, not an RCT**
843. Kowalik I, Ciszewski J, Dąbrowski R, et al. Clinical factors affecting long term survival in patients with systolic heart failure and cardiac resynchronization therapy in advanced age. *Pol Merkur Lekarski*. 2018;45(270):220-5. - **Addresses effectiveness questions only and is not RCT**
844. Koyak Z, de Groot JR, Krimly A, et al. Cardiac resynchronization therapy in adults with congenital heart disease. *Europace*. 2018 Feb 1;20(2):315-22. doi: 10.1093/europace/euw386. PMID: 28108550. - **Does not address outcome of interest**
845. Kpaeyeh JA, Jr., Divoky L, Hyer JM, et al. Impact of Renal Function on Survival After Cardiac Resynchronization Therapy. *Am J Cardiol*. 2017 Jul 15;120(2):262-6. doi: 10.1016/j.amjcard.2017.04.017. PMID: 28545627. - **Addresses only effectiveness, not an RCT**
846. Kramer DB, Jones PW, Rogers T, et al. Patterns of physical activity and survival following cardiac resynchronization therapy implantation: the ALTITUDE activity study. *Europace*. 2017 Nov 1;19(11):1841-7. doi: 10.1093/europace/euw267. PMID: 27702867. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
847. Kramer DB, Normand SLT, Volya R, et al. Facility-Level Variation and Clinical Outcomes in Use of Cardiac Resynchronization Therapy With and Without an Implantable Cardioverter-Defibrillator. *Circ Cardiovasc Qual Outcomes*. 2018;11(12):e004763. doi: 10.1161/circoutcomes.118.004763 . - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
848. Kranig W, Grove RG, Wolff EW, et al. Multiple BIV stimulation combinations by using two RV leads improve potential for response to CRT: results of the TRIV HF ICD study. *Europace*. 2015;17:iii79. doi: 10.1093/europace/euv158. PMID: CN-01131366. – **Not full report**
849. Kreuz J, Horlbeck F, Linhart M, et al. Independent predictors of mortality in patients with advanced heart failure treated by cardiac resynchronization therapy. *Europace*. 2012 2012 Nov;14(11):1596-601. - **Addresses only effectiveness, not an RCT**
850. Krishnamoorthy A, Pokorney SD, Lewis RK, et al. Cardiac implantable electronic device removal in patients with left ventricular assist device associated infections. *J Cardiovasc Electrophysiol*. 2014 Nov;25(11):1199-205. doi: 10.1111/jce.12461. PMID:

- 24890850 - **Not relevant to Key Questions**
851. Kronborg MB, Albertsen AE, Nielsen JC, et al. Long-term clinical outcome and left ventricular lead position in cardiac resynchronization therapy. *Europace*. 2009 2009 Sep;11(9):1177-82. - **Not relevant to Key Questions**
852. Kronborg MB, Johansen JB, Riahi S, et al. An anterior left ventricular lead position is associated with increased mortality and non-response in cardiac resynchronization therapy. *Int J Cardiol*. 2016 Nov 1;222:157-62. doi: 10.1016/j.ijcard.2016.07.235. PMID: 27494729. - **Does not address outcome of interest**
853. Kronborg MB, Johansen JB, Riahi S, et al. Association between right ventricular lead position and clinical outcomes in patients with cardiac resynchronization therapy. *Europace*. 2018 Apr 1;20(4):629-35. doi: 10.1093/europace/euw424. PMID: 28340014. - **Does not address outcome of interest**
854. Kronborg MB, Mortensen PT, Kirkfeldt RE, et al. Very long term follow-up of cardiac resynchronization therapy: clinical outcome and predictors of mortality. *Eur J Heart Fail*. 2008 2008 Aug;10(8):796-801. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
855. Kronborg MB, Nielsen JC, Mortensen PT. Electrocardiographic patterns and long-term clinical outcome in cardiac resynchronization therapy. *Europace*. 2010 2010 Feb;12(2):216-22. - **Other: QRS or LVEF not specified**
856. Kronborg MB, Sommer A, Fyenbo DB, et al. Left ventricular regional remodeling and lead position during cardiac resynchronization therapy. *Heart Rhythm*. 2018 Oct;15(10):1542-9. doi: 10.1016/j.hrthm.2018.04.012. PMID: 29678780. - **Does not address outcome of interest**
857. Krum H, Lemke B, Birnie D, et al. A novel algorithm for individualized cardiac resynchronization therapy: rationale and design of the adaptive cardiac resynchronization therapy trial. *Am Heart J*. 2012 2012 May;163(5):747-52.e1. - **No original data**
858. Krupa W, Rozwodowska M, Sielski S, et al. Influence of cardiac resynchronization therapy on oxidative stress markers in patients with chronic heart failure. *Cardiol J*. 2014;21(5):576-82. doi: 10.5603/CJ.a2014.0051. PMID: 25471244. - **Does not address outcome of interest**
859. Kubala M, Guedon-Moreau L, Anselme F, et al. Utility of Frailty Assessment for Elderly Patients Undergoing Cardiac Resynchronization Therapy. *JACC Clin Electrophysiol*. 2017 Dec 26;3(13):1523-33. doi: 10.1016/j.jacep.2017.06.012. PMID: 29759834. - **Does not address outcome of interest**
860. Kuniyoshi RR, Martinelli M, Negrão CE, et al. Effects of cardiac resynchronization therapy on muscle sympathetic nerve activity.

- PACE - Pacing and Clinical Electrophysiology. 2014;37(1):11-8. doi: 10.1111/pace.12254. - **Addresses only effectiveness, not an RCT**
861. Kuperstein R, Goldenberg I, Moss AJ, et al. Left atrial volume and the benefit of cardiac resynchronization therapy in the MADIT-CRT trial. *Circ Heart Fail.* 2014 2014 Jan;7(1):154-60 - **Not relevant to Key Questions**
862. Kurek A, Tajstra M, Gadula-Gacek E, et al. Impact of Remote Monitoring on Long-Term Prognosis in Heart Failure Patients in a Real-World Cohort: Results From All-Comers COMMIT-HF Trial. *J Cardiovasc Electrophysiol.* 2017 Apr;28(4):425-31. doi: 10.1111/jce.13174. PMID: 28176442. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
863. Kusiak A, Wilinski J, Wojciechowska W, et al. Echocardiographic assessment of right ventricular function in responders and non-responders to cardiac resynchronization therapy. *Arch Med Sci.* 2015 Aug 12;11(4):736-42. doi: 10.5114/aoms.2015.53292. PMID: 26322084. - **Addresses only effectiveness, not an RCT**
864. Kusiak A, Wilinski J, Wojciechowska W, et al. Effects of biventricular pacing on right ventricular function assessed by standard echocardiography. *Kardiol Pol.* 2012 2012;70(9):883-8 - **Not relevant to Key Questions**
865. Kusiak A, Wilinski J, Wojciechowska W, et al. Effects of biventricular pacing on right ventricular function assessed by standard echocardiography. *Kardiol Pol.* 2012 2012;70(9):883-8. - **Addresses only effectiveness, not an RCT**
866. Kutyla V, Geller L, Bogyi P, et al. Effect of cardiac resynchronization therapy with implantable cardioverter defibrillator versus cardiac resynchronization therapy with pacemaker on mortality in heart failure patients: results of a high-volume, single-centre experience. *Eur J Heart Fail.* 2014 Dec;16(12):1323-30. doi: 10.1002/ejhf.185. PMID: 25379962. - **Addresses only effectiveness, not an RCT**
867. Kutyla V, Klein HU, Wang PJ, et al. Clinical significance of ventricular tachyarrhythmias in patients treated with CRT-D. *Heart Rhythm.* 2013 2013 Jul;10(7):943-50.-**Other: Not predictor of interest**
868. Kutyla V, Kosztin A, Klein HU, et al. Left Ventricular Lead Location and Long-Term Outcomes in Cardiac Resynchronization Therapy Patients. *JACC: Clinical Electrophysiology.* 2018;4(11):1410-20. doi: 10.1016/j.jacep.2018.07.006. - **Other: duplicate data**
869. Kutyla V, Moss AJ, Solomon SD, et al. Reduced risk of life-threatening ventricular tachyarrhythmias with cardiac resynchronization therapy: relationship to left ventricular ejection fraction. *Eur J Heart Fail.*

- 2015 Sep;17(9):971-8. doi: 10.1002/ejhf.311. PMID: 26173635. **-Other: same patients included in the main study with 1820 subjects.**
870. Kutyifa V, Stockburger M, Daubert JP, et al. PR interval identifies clinical response in patients with non-left bundle branch block: a Multicenter Automatic Defibrillator Implantation Trial-Cardiac Resynchronization Therapy substudy. *Circ Arrhythm Electrophysiol.* 2014 Aug;7(4):645-51. doi: 10.1161/circep.113.001299. PMID: 24963007 - **Not relevant to Key Questions**
871. Kutyifa V, Stockburger M, Daubert JP, et al. PR interval identifies clinical response in patients with non-left bundle branch block: a Multicenter Automatic Defibrillator Implantation Trial-Cardiac Resynchronization Therapy substudy. *Circ Arrhythm Electrophysiol.* 2014 Aug;7(4):645-51. doi: 10.1161/circep.113.001299. PMID: 24963007. - **Addresses only effectiveness, not an RCT**
872. Kutyifa V, Vermilye K, Solomon SD, et al. Long-term outcomes of cardiac resynchronization therapy by left ventricular ejection fraction. *Eur J Heart Fail.* 2019;21(3):360-9. doi: 10.1002/ejhf.1357. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
873. Kuyumcu MS, Alagoz M, Yayla C, et al. Association between cardiac resynchronization therapy response and sexual activity in patients with heart failure. *Hellenic J Cardiol.* 2018 Aug 28doi: 10.1016/j.hjc.2018.08.005. PMID: 30170020. - **Does not address outcome of interest**
874. Kuznetsov VA, Soldatova AM, Kasprzak JD, et al. Echocardiographic markers of dyssynchrony as predictors of super-response to cardiac resynchronization therapy - a pilot study. *Cardiovasc Ultrasound.* 2018 Oct 2;16(1):24. doi: 10.1186/s12947-018-0140-0. PMID: 30285762. - **Does not address outcome of interest**
875. Kydd AC, Khan F, Gopalan D, et al. Utility of speckle tracking echocardiography to characterize dysfunctional myocardium in patients with ischemic cardiomyopathy referred for cardiac resynchronization therapy. *Echocardiography.* 2014;31(6):736-43. doi: 10.1111/echo.12458. - **Does not address outcome of interest**
876. Kydd AC, Khan FZ, O'Halloran D, et al. Radial strain delay based on segmental timing and strain amplitude predicts left ventricular reverse remodeling and survival after cardiac resynchronization therapy. *Circ Cardiovasc Imaging.* 2013 2013 Mar 1;6(2):177-84 - **Not relevant to Key Questions**
877. Kydd AC, Khan FZ, Ring L, et al. Development of a multiparametric score to predict left ventricular remodelling and prognosis after cardiac resynchronization therapy. *Eur J Heart Fail.* 2014 Nov;16(11):1206-13. doi: 10.1002/ejhf.167. PMID: 25302484. - **Does not address outcome of interest**

878. Kydd AC, Khan FZ, Watson WD, et al. Prognostic benefit of optimum left ventricular lead position in cardiac resynchronization therapy: follow-up of the TARGET Study Cohort (Targeted Left Ventricular Lead Placement to guide Cardiac Resynchronization Therapy). *JACC Heart Fail.* 2014 Jun;2(3):205-12. doi: 10.1016/j.jchf.2013.11.010. PMID: 24952685. - **Does not address outcome of interest**
879. Kyriacou A, Whinnett ZI, Sen S, et al. Improvement in coronary blood flow velocity with acute biventricular pacing is predominantly due to an increase in a diastolic backward-travelling decompression (suction) wave. *Circulation.* 2012 2012 Sep 11;126(11):1334-44 - **Not relevant to Key Questions**
880. Lafitte S, Garrigue S, Perron JM, et al. Improvement of left ventricular wall synchronization with multisite ventricular pacing in heart failure: a prospective study using Doppler tissue imaging. *Eur J Heart Fail.* 2004 2004 Mar 1;6(2):203-12 - **Not relevant to Key Questions**
881. Laish-Farkash A, Bruoha S, Katz A, et al. Morbidity and mortality with cardiac resynchronization therapy with pacing vs. with defibrillation in octogenarian patients in a real-world setting. *Europace.* 2017 Aug 1;19(8):1357-63. doi: 10.1093/europace/euw238. PMID: 27733457. - **Addresses only effectiveness, not an RCT**
882. Laksman Z, Yee R, Stirrat J, et al. Model-based navigation of left and right ventricular leads to optimal targets for cardiac resynchronization therapy: a single-center feasibility study. *Circ Arrhythm Electrophysiol.* 2014 Dec;7(6):1040-7. doi: 10.1161/circep.114.001729. PMID: 25221334. - **Does not address outcome of interest**
883. Lalonde M, Wells RG, Birnie D, et al. Development and optimization of SPECT gated blood pool cluster analysis for the prediction of CRT outcome. *Med Phys.* 2014;41(7)doi: 10.1118/1.4883881 - **Not relevant to Key Questions**
884. Lalonde M, Wells RG, Birnie D, et al. Development and optimization of SPECT gated blood pool cluster analysis for the prediction of CRT outcome. *Med Phys.* 2014;41(7)doi: 10.1118/1.4883881. PMID: 24989409. - **Does not address outcome of interest**
885. Lamas GA, Lee KL, Sweeney MO, et al. Ventricular pacing or dual-chamber pacing for sinus-node dysfunction. *N Engl J Med.* 2002 2002 Jun 13;346(24):1854-62. - **Does not evaluate a CRT**
886. Lamas GA, Lee KL, Sweeney MO, et al. Ventricular pacing or dual-chamber pacing for sinus-node dysfunction. *N Engl J Med.* 2002 2002 Jun 13;346(24):1854-62. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
887. Lambiase PD, Gold MR, Hood M, et al. Evaluation of subcutaneous ICD early performance in hypertrophic cardiomyopathy from the pooled EFFORTLESS and IDE cohorts. *Heart Rhythm.* 2016 May;13(5):1066-74. doi: 10.1016/j.hrthm.2016.01.001. PMID: 26767422. - **Population**

- inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
888. Lancellotti P, Melon P, Sakalihasan N, et al. Effect of cardiac resynchronization therapy on functional mitral regurgitation in heart failure. *Am J Cardiol.* 2004 2004 Dec 1;94(11):1462-5. - **Addresses only effectiveness, not an RCT**
889. Landolina M, Gasparini M, Lunati M, et al. Heart rate variability monitored by the implanted device predicts response to CRT and long-term clinical outcome in patients with advanced heart failure. *Eur J Heart Fail.* 2008 2008 Nov;10(11):1073-9.-**Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
890. Landolina M, Lunati M, Gasparini M, et al. Comparison of the effects of cardiac resynchronization therapy in patients with class II versus class III and IV heart failure (from the InSync/InSync ICD Italian Registry). *Am J Cardiol.* 2007 2007 Sep 15;100(6):1007-12 - **Not relevant to Key Questions**
891. Landolina M, Lunati M, Gasparini M, et al. Comparison of the Effects of Cardiac Resynchronization Therapy in Patients With Class II Versus Class III and IV Heart Failure (from the InSync/InSync ICD Italian Registry)(dagger)(dagger)Conflicts of interest: ... *Am. J. Cardiol.* 2007 2007;100(6):1007-12. - **Population inclusion criteria do not fall**
- within the QRS \geq 120ms and LVEF \leq 35% range**
892. Lane RE, Mayet J, Peters NS, et al. Comparison of temporary bifocal right ventricular pacing and biventricular pacing for heart failure: evaluation by tissue Doppler imaging. *Heart.* 2008 2008 Jan;94(1):53-8.-**Other: <30 patients**
893. Lang NN, Badar AA, Pettit SJ, et al. Interventricular lead separation is critical for NT-proBNP reduction after cardiac resynchronization therapy. *Biomark Med.* 2014;8(6):797-806. doi: 10.2217/bmm.13.159. PMID: 25224936. - **Does not address outcome of interest**
894. Lau CP, Yu CM, Chau E, et al. Reversal of left ventricular remodeling by synchronous biventricular pacing in heart failure. *Pacing Clin Electrophysiol.* 2000 2000 Nov;23(11 Pt 2):1722-5.- **Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
895. Laurenzi F, Achilli A, Avella A, et al. Biventricular upgrading in patients with conventional pacing system and congestive heart failure: results and response predictors. *Pacing Clin Electrophysiol.* 2007 2007 Sep;30(9):1096-104. - **Addresses only effectiveness, not an RCT**
896. Lazárová M, Marek D, Heinc P, et al. The issue of non-responders to cardiac resynchronization therapy.

- Kardiologicka Revue.
2014;16(2):106-8. – **Not in English**
897. Lebedeva V, Lubimceva T, Trukshina M, et al. Cardiac resynchronization therapy: long-term results of atrioventricular and interventricular delay optimization by ECG. Europace. Conference: world congress in cardiac electrophysiology and cardiac techniques 2016. France. 2016;18:i135. doi: 10.1093/europace/euw158. PMID: CN-01406427. – **Not full report**
898. Lebedeva V, Lubimceva T, Trukshina M, et al. Cardiac resynchronization therapy optimization by ECG. Europace. 2015;17:iii152. doi: 10.1093/europace/euv168. PMID: CN-01131352. - **Does not address outcome of interest**
899. Lebedeva V, Lubimceva T, Trukshina M, et al. ECG for cardiac resynchronization therapy optimization. European heart journal. 2015;36:388. doi: 10.1093/eurheartj/ehv399. PMID: CN-01129698. – **Not full report**
900. Leclercq C, Burri H, Curnis A, et al. Six-month biventricular CRT response with a quadripolar CRT system in the more response on cardiac resynchronization Therapy with multipoint pacing (MORE-CRT MPP) trial. Europace. Conference: european heart rhythm association EUROPACE-CARDIOSTIM 2017 congress. Austria. 2017;19(Supplement 3):iii87-iii8. PMID: CN-01421488. – **Not full report**
901. Leclercq C, Cazeau S, Ritter P, et al. A pilot experience with permanent biventricular pacing to treat advanced heart failure. Am. Heart J. 2000 2000;140(6):862-70 - **Not relevant to Key Questions**
902. Leclercq C, Cazeau S, Ritter P, et al. A pilot experience with permanent biventricular pacing to treat advanced heart failure. Am. Heart J. 2000 2000;140(6):862-70. - **Addresses only effectiveness, not an RCT**
903. Leclercq C, Gras D, Tang A, et al. Comparative effects of ventricular resynchronization therapy in heart failure patients with or without coronary artery disease. Ann Cardiol Angeiol (Paris). 2004 2004 Jul;53(4):171-6. - **Addresses only effectiveness, not an RCT**
904. Leclercq C, Gras D, Tang A, et al. Comparative effects of ventricular resynchronization therapy in heart failure patients with or without coronary artery disease. Ann Cardiol Angeiol (Paris). 2004 2004 Jul;53(4):171-6. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
905. Leclercq C, Sadoul N, Mont L, et al. Comparison of right ventricular septal pacing and right ventricular apical pacing in patients receiving cardiac resynchronization therapy defibrillators: the SEPTAL CRT Study. Eur Heart J. 2016 Feb 1;37(5):473-83. doi: 10.1093/eurheartj/ehv422. PMID: 26374852. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
906. Lecoq G, Leclercq C, Leray E, et al. Clinical and electrocardiographic

- predictors of a positive response to cardiac resynchronization therapy in advanced heart failure. *Eur Heart J*. 2005 Jun;26(11):1094-100.-
Other: No required number of predictors in multivariate analysis
907. Lee AW, Crozier A, Hyde ER, et al. Biophysical Modeling to Determine the Optimization of Left Ventricular Pacing Site and AV/VV Delays in the Acute and Chronic Phase of Cardiac Resynchronization Therapy. *J Cardiovasc Electrophysiol*. 2017 Feb;28(2):208-15. doi: 10.1111/jce.13134. PMID: 27885749. - **Does not address outcome of interest**
908. Lee AY, Kutiyifa V, Ruwald MH, et al. Digoxin therapy and associated clinical outcomes in the MADIT-CRT trial. *Heart Rhythm*. 2015 Sep;12(9):2010-7. doi: 10.1016/j.hrthm.2015.05.016. PMID: 26025322. - **Does not address outcome of interest**
909. Lee AY, Moss AJ, Ruwald MH, et al. Temporal Influence of Heart Failure Hospitalizations Prior to Implantable Cardioverter Defibrillator or Cardiac Resynchronization Therapy With Defibrillator on Subsequent Outcome in Mild Heart Failure Patients (from MADIT-CRT). *Am J Cardiol*. 2015 May 15;115(10):1423-7. doi: 10.1016/j.amjcard.2015.02.029. PMID: 25817576.-**Other: Outcomes are combined heart failure or death, or heart failure (doesn't look like hospitalization due to heart failure)**
910. Lee SA, Cha MJ, Cho Y, et al. Paced QRS duration and myocardial scar amount: predictors of long-term outcome of right ventricular apical pacing. *Heart Vessels*. 2016 Jul;31(7):1131-9. doi: 10.1007/s00380-015-0707-8. PMID: 26142378. - **Does not address outcome of interest**
911. Lee SH, Park SJ, Kim JS, et al. Mid-term outcomes in patients implanted with cardiac resynchronization therapy. *J Korean Med Sci*. 2014 Dec;29(12):1651-7. doi: 10.3346/jkms.2014.29.12.1651. PMID: 25469065. - **Does not address outcome of interest**
912. Lee Y, Mori N, Nakamura D, et al. New approach for rotational dyssynchrony using three-dimensional speckle tracking echocardiography. *Echocardiography*. 2014;31(4):492-8. doi: 10.1111/echo.12406. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
913. Lee YH, Wu JH, Asirvatham SJ, et al. Effects of atrioventricular conduction delay on the outcome of cardiac resynchronization therapy. *J Electrocardiol*. 2014 Nov-Dec;47(6):930-5. doi: 10.1016/j.jelectrocard.2014.07.024. PMID: 25169796. - **Does not address outcome of interest**
914. Leenders GE, De Boeck BW, Teske AJ, et al. Septal rebound stretch is a strong predictor of outcome after cardiac resynchronization therapy. *J Card Fail*. 2012 May;18(5):404-12. - **Addresses only effectiveness, not an RCT**

915. Leenders GE, Lumens J, Cramer MJ, et al. Septal deformation patterns delineate mechanical dyssynchrony and regional differences in contractility analysis of patient data using a computer model. *Circ. Heart Fail.* 2012 2012;5(1):87-96 - **Not relevant to Key Questions**
916. Lehmann A, Lang J, Thaler E, et al. Considerations in patients undergoing implantation of a biventricular pacemaker. *J Cardiothorac Vasc Anesth.* 2002 2002 Apr;16(2):175-9. - **Addresses only effectiveness, not an RCT**
917. Lei J, Wang YG, Bhatta L, et al. Ventricular geometry-regularized QRSd predicts cardiac resynchronization therapy response: machine learning from crosstalk between electrocardiography and echocardiography. *Int J Cardiovasc Imaging.* 2019 May 18doi: 10.1007/s10554-019-01545-5. PMID: 31104177. - **Does not address outcome of interest**
918. Lellouche N, De Diego C, Boyle NG, et al. Relationship between mechanical and electrical remodelling in patients with cardiac resynchronization implanted defibrillators. *Europace.* 2011 2011 Aug;13(8):1180-7 - **Not relevant to Key Questions**
919. Lellouche N, De Diego C, Vaseghi M, et al. Cardiac resynchronization therapy response is associated with shorter duration of atrial fibrillation. *Pacing Clin Electrophysiol.* 2007 2007 Nov;30(11):1363-8. - **Addresses only effectiveness, not an RCT**
920. Lenarczyk R, Jedrzejczyk-Patej E, Mazurek M, et al. Quality of life in cardiac resynchronization recipients: association with response and impact on outcome. *Pacing Clin Electrophysiol.* 2015 Jan;38(1):8-17. doi: 10.1111/pace.12523. PMID: 25319879 - **Not relevant to Key Questions**
921. Lenarczyk R, Jedrzejczyk-Patej E, Mazurek M, et al. Quality of life in cardiac resynchronization recipients: association with response and impact on outcome. *Pacing Clin Electrophysiol.* 2015 Jan;38(1):8-17. doi: 10.1111/pace.12523. PMID: 25319879. - **Addresses only effectiveness, not an RCT**
922. Lenarczyk R, Wozniak A, Kowalski O, et al. Effect of cardiac resynchronization on gradient reduction in patients with obstructive hypertrophic cardiomyopathy: preliminary study. *Pacing Clin Electrophysiol.* 2011 2011 Nov;34(11):1544-52. - **Addresses only effectiveness, not an RCT**
923. Leon AR, Greenberg JM, Kanuru N, et al. Cardiac resynchronization in patients with congestive heart failure and chronic atrial fibrillation: effect of upgrading to biventricular pacing after chronic right ventricular pacing. *J Am Coll Cardiol.* 2002 2002 Apr 17;39(8):1258-63. - **Addresses only effectiveness, not an RCT**
924. Leong DP, Höke U, Delgado V, et al. Right ventricular function and survival following cardiac resynchronisation therapy. *Heart.* 2013;99(10):722-8. doi:

- 10.1136/heartjnl-2012-303076. - **Does not address outcome of interest**
925. Lercher P, Lunati M, Rordorf R, et al. Long-term reverse remodeling by cardiac resynchronization therapy with MultiPoint Pacing: A feasibility study of noninvasive hemodynamics-guided device programming. *Heart Rhythm*. 2018 Jun 22doi: 10.1016/j.hrthm.2018.06.032. PMID: 29940305. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
926. Leshem E, Suleiman M, Laish-Farkash A, et al. Contemporary rates and outcomes of single- vs. dual-coil implantable cardioverter defibrillator lead implantation: data from the Israeli ICD Registry. *Europace*. 2017 Sep 1;19(9):1485-92. doi: 10.1093/europace/euw199. PMID: 27702848. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
927. Leshem E, Suleiman M, Laish-Farkash A, et al. Impact of quadripolar LV leads on heart failure hospitalization rates among patients implanted with CRT-D: data from the Israeli ICD Registry. *J Interv Card Electrophysiol*. 2018 Jan;51(1):5-12. doi: 10.1007/s10840-017-0305-z. PMID: 29274032. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
928. Levy WC, Li Y, Reed SD, et al. Does the Implantable Cardioverter-Defibrillator Benefit Vary With the Estimated Proportional Risk of Sudden Death in Heart Failure Patients? *JACC Clin Electrophysiol*. 2017 Mar;3(3):291-8. doi: 10.1016/j.jacep.2016.09.006. PMID: 28553663. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
929. Leyva F, Foley PW, Chalil S, et al. Female gender is associated with a better outcome after cardiac resynchronization therapy. *Pacing Clin Electrophysiol*. 2011 2011 Jan;34(1):82-8. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
930. Leyva F, Foley PW, Stegemann B, et al. Development and validation of a clinical index to predict survival after cardiac resynchronisation therapy. *Heart*. 2009 2009 Oct;95(19):1619-25 - **Not relevant to Key Questions**
931. Leyva F, Taylor RJ, Foley PW, et al. Left ventricular midwall fibrosis as a predictor of mortality and morbidity after cardiac resynchronization therapy in patients with nonischemic cardiomyopathy. *J Am Coll Cardiol*. 2012 2012 Oct 23;60(17):1659-67 - **Not relevant to Key Questions**
932. Leyva F, Umar F, Taylor RJ, et al. The clinical outcome of cardiac resynchronization therapy in post-surgical valvular cardiomyopathy. *Europace*. 2016 May;18(5):732-8. doi: 10.1093/europace/euv287. PMID: 26802014. - **Does not address outcome of interest**
933. Leyva F, Zegard A, Acquaye E, et al. Outcomes of Cardiac Resynchronization Therapy With or

Without Defibrillation in Patients With Nonischemic Cardiomyopathy. *J Am Coll Cardiol.* 2017 Sep 5;70(10):1216-27. doi: 10.1016/j.jacc.2017.07.712. PMID: 28859784. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**

934. Leyva F, Zegard A, Okafor O, et al. Survival after cardiac resynchronization therapy: results from 50 084 implantations. *Europace.* 2018((Leyva F.; Zegard A.; Okafor O.; Ahmed A.) Aston Medical Research Institute, Aston University Medical School, Aston University, Birmingham, United Kingdom)doi: 10.1093/europace/euy267. - **Addresses effectiveness questions only and is not RCT**
935. Leyva F, Zegard A, Patel K, et al. Clinical outcomes after upgrading from pacemakers to cardiac resynchronization therapy. *Pacing Clin Electrophysiol.* 2018 Mar;41(3):290-8. doi: 10.1111/pace.13287. PMID: 29369371. - **Does not address outcome of interest**
936. Leyva F, Zegard A, Qiu T, et al. Cardiac Resynchronization Therapy Using Quadripolar Versus Non-Quadripolar Left Ventricular Leads Programmed to Biventricular Pacing With Single-Site Left Ventricular Pacing: Impact on Survival and Heart Failure Hospitalization. *J Am Heart Assoc.* 2017 Oct 17;6(10)doi: 10.1161/jaha.117.007026. PMID: 29042422. - **Population inclusion criteria do not fall within the**

QRS \geq 120ms and LVEF \leq 35% range

937. Leyva F, Zegard A, Qiu T, et al. Long-term outcomes of cardiac resynchronization therapy in adult congenital heart disease. *PACE - Pacing and Clinical Electrophysiology.* 2019doi: 10.1111/pace.13670. - **Addresses effectiveness questions only and is not RCT**
938. Leyva F, Zegard A, Taylor R, et al. Renal function and the long-term clinical outcomes of cardiac resynchronization therapy with or without defibrillation. *PACE - Pacing and Clinical Electrophysiology.* 2019((Leyva F., cardiologists@hotmail.com; Zegard A.) Aston Medical Research Institute, Aston Medical School, Aston University, Birmingham, United Kingdom)doi: 10.1111/pace.13659. - **Addresses effectiveness questions only and is not RCT**
939. Leyva F, Zegard A, Umar F, et al. Long-term clinical outcomes of cardiac resynchronization therapy with or without defibrillation: impact of the aetiology of cardiomyopathy. *Europace.* 2018 Apr 25doi: 10.1093/europace/eux357. PMID: 29697764. - **Addresses only effectiveness, not an RCT**
940. Li K, Qian Z, Hou X, et al. The incidence and outcomes of delayed response to cardiac resynchronization therapy. *Pacing Clin Electrophysiol.* 2018 Jan;41(1):73-80. doi: 10.1111/pace.13252. PMID:

29222875. - **Does not address outcome of interest**
941. Li X, Yang D, Kusumoto F, et al. Predictors and outcomes of cardiac resynchronization therapy extended to the second generator. *Heart Rhythm*. 2017 Dec;14(12):1793-800. doi: 10.1016/j.hrthm.2017.09.002. PMID: 28917559. - **Does not address outcome of interest**
942. Liang Y, Pan W, Su Y, et al. Meta-analysis of randomized controlled trials comparing isolated left ventricular and biventricular pacing in patients with chronic heart failure. *Am. J. Cardiol*. 2011 2011;108(8):1160-5. – **No original data**
943. Liang Y, Yu H, Zhou W, et al. Left Ventricular Lead Placement Targeted at the Latest Activated Site Guided by Electrophysiological Mapping in Coronary Sinus Branches Improves Response to Cardiac Resynchronization Therapy. *J Cardiovasc Electrophysiol*. 2015 Dec;26(12):1333-9. doi: 10.1111/jce.12771. PMID: 26249040. - **Addresses only effectiveness, not an RCT**
944. Lilli A, Ricciardi G, Porciani MC, et al. Cardiac resynchronization therapy: gender related differences in left ventricular reverse remodeling. *Pacing Clin Electrophysiol*. 2007 2007 Nov;30(11):1349-55. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
945. Lim P, Donal E, Lafitte S, et al. Multicentre study using strain delay index for predicting response to cardiac resynchronization therapy (MUSIC study). *Eur J Heart Fail*. 2011 2011 Sep;13(9):984-91 - **Not relevant to Key Questions**
946. Lim P, Donal E, Lafitte S, et al. Multicentre study using strain delay index for predicting response to cardiac resynchronization therapy (MUSIC study). *Eur J Heart Fail*. 2011 2011 Sep;13(9):984-91. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
947. Limongelli G, Roselli T, Pacileo G, et al. Effect of cardiac resynchronization therapy on cardiotrophin-1 circulating levels in patients with heart failure. *Intern Emerg Med*. 2014 2014 Feb;9(1):43-50 - **Not relevant to Key Questions**
948. Lin G, Gersh BJ, Greene EL, et al. Renal function and mortality following cardiac resynchronization therapy. *Eur Heart J*. 2011 2011 Jan;32(2):184-90 - **Not relevant to Key Questions**
949. Lin G, Gersh BJ, Greene EL, et al. Renal function and mortality following cardiac resynchronization therapy. *Eur Heart J*. 2011 2011 Jan;32(2):184-90. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
950. Lin G, Rea RF, Hammill SC, et al. Effect of cardiac resynchronisation therapy on occurrence of ventricular arrhythmia in patients with implantable cardioverter defibrillators undergoing upgrade to cardiac resynchronisation therapy devices. *Heart*. 2008 2008

Feb;94(2):186-90 - **Not relevant to Key Questions**

951. Lin G, Rea RF, Hammill SC, et al. Effect of cardiac resynchronisation therapy on occurrence of ventricular arrhythmia in patients with implantable cardioverter defibrillators undergoing upgrade to cardiac resynchronisation therapy devices. *Heart*. 2008 2008

Feb;94(2):186-90. - **Addresses only effectiveness, not an RCT**

952. Lin H, Zhou Y, Xu G. Predictors for cardiac resynchronization therapy response: the importance of QRS morphology and left ventricular lead position. *Int Heart J*. 2014;55(3):256-63. PMID: 24806381. - **Does not address outcome of interest**

953. Lin J, Buhr KA, Kipp R. Effect of PR Interval on Outcomes Following Cardiac Resynchronization Therapy: A Secondary Analysis of the COMPANION Trial. *J Cardiovasc Electrophysiol*. 2017 Feb;28(2):185-91. doi: 10.1111/jce.13131. PMID: 27885751. - **Does not address outcome of interest**

954. Lin X, Xu H, Zhao X, et al. Sites of latest mechanical activation as assessed by SPECT myocardial perfusion imaging in ischemic and dilated cardiomyopathy patients with LBBB. *Eur J Nucl Med Mol Imaging*. 2014 2014 Feb 28 - **Not relevant to Key Questions**

955. Linde C, Abraham WT, Gold MR, et al. Cardiac resynchronization therapy in asymptomatic or mildly symptomatic heart failure patients in relation to etiology: results from the REVERSE (REsynchronization

reVERses Remodeling in Systolic Left vEntricular Dysfunction) study. *J Am Coll Cardiol*. 2010 2010 Nov 23;56(22):1826-31 - **Not relevant to Key Questions**

956. Linde C, Abraham WT, Gold MR, et al. Cardiac resynchronization therapy in asymptomatic or mildly symptomatic heart failure patients in relation to etiology: results from the REVERSE (REsynchronization reVERses Remodeling in Systolic Left vEntricular Dysfunction) study. *J Am Coll Cardiol*. 2010 2010 Nov 23;56(22):1826-31. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**

957. Linde C, Abraham WT, Gold MR, et al. Randomized trial of cardiac resynchronization in mildly symptomatic heart failure patients and in asymptomatic patients with left ventricular dysfunction and previous heart failure symptoms. *J Am Coll Cardiol*. 2008 2008 Dec 2;52(23):1834-43. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**

958. Linde C, Daubert C, Abraham WT, et al. Impact of ejection fraction on the clinical response to cardiac resynchronization therapy in mild heart failure. *Circ Heart Fail*. 2013 2013 Nov;6(6):1180-9. - **Other: EF $<$ 40**

959. Linde C, Daubert C, Abraham WT, et al. Impact of ejection fraction on the clinical response to cardiac resynchronization therapy in mild heart failure. *Circulation: Heart Failure*. 2013;6(6):1180-9. doi: 10.1161/circheartfailure.113.000326. - **Population inclusion criteria**

do not fall within the QRS \geq 120ms and LVEF \leq 35% range

960. Linde C, Gold MR, Abraham WT, et al. Long-term impact of cardiac resynchronization therapy in mild heart failure: 5-year results from the REsynchronization reVERses Remodeling in Systolic left vEntricular dysfunction (REVERSE) study. *Eur Heart J*. 2013 2013 Sep;34(33):2592-9. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
961. Linde C, Stahlberg M, Benson L, et al. Gender, underutilization of cardiac resynchronization therapy, and prognostic impact of QRS prolongation and left bundle branch block in heart failure. *Europace*. 2015 Mar;17(3):424-31. doi: 10.1093/europace/euu205. PMID: 25164429 - **Not relevant to Key Questions**
962. Linde C, Stahlberg M, Benson L, et al. Gender, underutilization of cardiac resynchronization therapy, and prognostic impact of QRS prolongation and left bundle branch block in heart failure. *Europace*. 2015 Mar;17(3):424-31. doi: 10.1093/europace/euu205. PMID: 25164429. - **Addresses only effectiveness, not an RCT**
963. Linde C, Tang A, Cowie MR, et al. Physical activity measured with implanted devices predicts heart failure outcomes. *European journal of heart failure*. Conference: heart failure 2017 and the 4th world congress on acute heart failure. France. 2017;19:347. doi: 10.1002/ejhf.833. PMID: CN-01376922. - **Not full report**
964. Linde CM, Normand C, Bogale N, et al. Upgrades from a previous device compared to de novo cardiac resynchronization therapy in the European Society of Cardiology CRT Survey II. *Eur J Heart Fail*. 2018 May 27doi: 10.1002/ejhf.1235. PMID: 29806208. - **Does not address outcome of interest**
965. Lindvall C, Chatterjee NA, Chang Y, et al. National Trends in the Use of Cardiac Resynchronization Therapy With or Without Implantable Cardioverter-Defibrillator. *Circulation*. 2016 Jan 19;133(3):273-81. doi: 10.1161/circulationaha.115.018830. PMID: 26635400. - **Does not address outcome of interest**
966. Lipar L, Srivathsan K, Scott LR. Short-term outcome of cardiac resynchronization therapy - a comparison between newly implanted and chronically right ventricle-paced patients. *Int J Cardiol*. 2016 Sep 15;219:195-9. doi: 10.1016/j.ijcard.2016.06.054. PMID: 27327506. - **Does not address outcome of interest**
967. Lipoldova J, Ozabalova E, Meluzin J, et al. Usefulness of left ventricle dyssynchrony assessment before cardiac resynchronization implantation. *Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub*. 2010 2010 Mar;154(1):39-46 - **Not relevant to Key Questions**
968. Lisy M, Schmid E, Kalender G, et al. Coronary sinus lead extraction in CRT patients with CIED-related infection: risks, implications and outcomes. *Minerva Cardioangiol*. 2015 Apr;63(2):91-8. PMID:

24941962. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
969. Liu K, Hua BT, Guo T, et al. The assessment of the long-term effects of elective CRT-D of coronary heart disease after PCI. *Eur Rev Med Pharmacol Sci.* 2017 Mar;21(6):1313-7. PMID: 28387919. - **Other: not relevant**
970. Liu X, Wei Q, Li Y, et al. Analysis of clinical efficacy and factors affecting complications of permanent pacemaker implantation. *Int J Clin Exp Med.* 2019;12(2):1972-8. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
971. Liu X, Yu H, Pei J, et al. Clinical characteristics and long-term prognosis in patients with chronic heart failure and reduced ejection fraction in china. *Heart Lung and Circulation.* 2014;23(9):818-26. doi: 10.1016/j.hlc.2014.02.022. - **Does not evaluate a CRT**
972. Liu X, Yu H, Pei J, et al. Clinical characteristics and long-term prognosis in patients with chronic heart failure and reduced ejection fraction in china. *Heart Lung and Circulation.* 2014;23(9):818-26. doi: 10.1016/j.hlc.2014.02.022. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
973. Livanis EG, Flevari P, Theodorakis GN, et al. Effect of biventricular pacing on heart rate variability in patients with chronic heart failure. *Eur J Heart Fail.* 2003 2003 Mar;5(2):175-8 - **Not relevant to Key Questions**
974. Livanis EG, Flevari P, Theodorakis GN, et al. Effect of biventricular pacing on heart rate variability in patients with chronic heart failure. *Eur J Heart Fail.* 2003 2003 Mar;5(2):175-8. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
975. Looi KL, Gajendragadkar PR, Khan FZ, et al. Cardiac resynchronisation therapy: pacemaker versus internal cardioverter-defibrillator in patients with impaired left ventricular function. *Heart.* 2014 May;100(10):794-9. doi: 10.1136/heartjnl-2014-305537. PMID: 24691411. - **Addresses only effectiveness, not an RCT**
976. Looi KL, Sidhu K, Cooper L, et al. Gender differences in the use of primary prevention ICDs in New Zealand patients with heart failure. *Heart Asia.* 2018;10(1):e010985. doi: 10.1136/heartasia-2017-010985. PMID: 29422952. - **Does not evaluate a CRT**
977. Lopez-Andres N, Rossignol P, Iraqi W, et al. Association of galectin-3 and fibrosis markers with long-term cardiovascular outcomes in patients with heart failure, left ventricular dysfunction, and dyssynchrony: insights from the CARE-HF (Cardiac Resynchronization in Heart Failure) trial. *Eur J Heart Fail.* 2012 2012 Jan;14(1):74-81 - **Not relevant to Key Questions**
978. Loughlin G, Avila P, Martinez-Ferrer JB, et al. Association of cardiac resynchronization therapy with the incidence of appropriate

- implantable cardiac defibrillator therapies in ischaemic and non-ischaemic cardiomyopathy. *Europace*. 2017 Nov 1;19(11):1818-25. doi: 10.1093/europace/euw303. PMID: 28339565. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
979. Lousinha A, Oliveira MM, Feliciano J, et al. Benefits of cardiac resynchronization therapy in "Very dilated cardiomyopathy": Beneficios da terapeutica de ressincronizacao cardiaca na <<miocardiopatia muito dilatada>>. *Rev. Port. Cardiol*. 2011 2011;30(3):283-94 - **Not relevant to Key Questions**
980. Lousinha A, Oliveira MM, Feliciano J, et al. Benefits of cardiac resynchronization therapy in "Very dilated cardiomyopathy": Beneficios da terapeutica de ressincronizacao cardiaca na <<miocardiopatia muito dilatada>>. *Rev. Port. Cardiol*. 2011 2011;30(3):283-94. - **Addresses only effectiveness, not an RCT**
981. Lousinha A, Oliveira MM, Feliciano J, et al. Benefits of cardiac resynchronization therapy in "Very dilated cardiomyopathy": Beneficios da terapeutica de ressincronizacao cardiaca na <<miocardiopatia muito dilatada>>. *Rev. Port. Cardiol*. 2011 2011;30(3):283-94. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
982. Loutfi M, Nawar M, Eltahan S, et al. Predictors of response to cardiac resynchronization therapy in chronic heart failure patients. *Egyptian Heart Journal*. 2016;68(4):227-36. doi: 10.1016/j.ehj.2016.01.001. - **Does not address outcome of interest**
983. Luedorff G, Grove R, Kowalski M, et al. Impact of chronic atrial fibrillation in patients with severe heart failure and indication for CRT: data of two registries with 711 patients (1999-2006 and 2007-6/2008). *Herzschrittmacherther Elektrophysiol*. 2011 2011 Dec;22(4):226-32 - **Not relevant to Key Questions**
984. Lumens J, Tayal B, Walmsley J, et al. Differentiating Electromechanical From Non-Electrical Substrates of Mechanical Discoordination to Identify Responders to Cardiac Resynchronization Therapy. *Circ Cardiovasc Imaging*. 2015 Sep;8(9):e003744. doi: 10.1161/circimaging.115.003744. PMID: 26338877. - **Does not address outcome of interest**
985. Lund LH, Benson L, Stahlberg M, et al. Age, prognostic impact of QRS prolongation and left bundle branch block, and utilization of cardiac resynchronization therapy: findings from 14,713 patients in the Swedish Heart Failure Registry. *Eur J Heart Fail*. 2014 Oct;16(10):1073-81. doi: 10.1002/ejhf.162. PMID: 25201219. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
986. Lund LH, Braunschweig F, Benson L, et al. Association between demographic, organizational, clinical, and socio-economic characteristics and underutilization of cardiac resynchronization

therapy: results from the Swedish Heart Failure Registry. *Eur J Heart Fail.* 2017 Oct;19(10):1270-9. doi: 10.1002/ejhf.781. PMID: 28176416. **- Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**

987. Lupu S, Mitre A, Sus I, et al. Changes in left atrial size and function early after cardiac resynchronization therapy as assessed by conventional two-dimensional echocardiography. *Med Ultrason.* 2018;20(3):362-70. doi: 10.11152/mu-1378. PMID: 30167591. **- Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
988. Lustgarten DL, Crespo EM, Arkhipova-Jenkins I, et al. His-bundle pacing versus biventricular pacing in cardiac resynchronization therapy patients: A crossover design comparison. *Heart Rhythm.* 2015 Jul;12(7):1548-57. doi: 10.1016/j.hrthm.2015.03.048. PMID: 25828601. **- Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
989. Luthje L, Vollmann D, Seegers J, et al. A randomized study of remote monitoring and fluid monitoring for the management of patients with implanted cardiac arrhythmia devices. *Europace.* 2015 Aug;17(8):1276-81. doi: 10.1093/europace/euv039. PMID: 25983310. **- Does not evaluate a CRT**
990. Ma CY, Liu S, Yang J, et al. Evaluation of Global Longitudinal Strain of Left Ventricle and Regional Longitudinal Strain in the

Region of Left Ventricular Leads Predicts the Response to Cardiac Resynchronization Therapy in Patients with Ischemic Heart Failure. *Cell Biochem Biophys.* 2014 2014 Mar 12 - **Not relevant to Key Questions**

991. Maass AH, Buck S, Nieuwland W, et al. Importance of heart rate during exercise for response to cardiac resynchronization therapy. *J Cardiovasc Electrophysiol.* 2009 2009 Jul;20(7):773-80 - **Not relevant to Key Questions**
992. Maass AH, Vernoooy K, Wijers SC, et al. Refining success of cardiac resynchronization therapy using a simple score predicting the amount of reverse ventricular remodelling: results from the Markers and Response to CRT (MARC) study. *Europace.* 2018 Feb 1;20(2):e1-e10. doi: 10.1093/europace/euw445. PMID: 28339818. **- Addresses only effectiveness, not an RCT**
993. Mada RO, Lysyansky P, Duchenne J, et al. New Automatic Tools to Identify Responders to Cardiac Resynchronization Therapy. *J Am Soc Echocardiogr.* 2016 Oct;29(10):966-72. doi: 10.1016/j.echo.2016.06.008. PMID: 27498280. **- Does not address outcome of interest**
994. Madaric J, Vanderheyden M, Van Laethem C, et al. Early and late effects of cardiac resynchronization therapy on exercise-induced mitral regurgitation: relationship with left ventricular dyssynchrony, remodelling and cardiopulmonary performance. *Eur Heart J.* 2007 2007 Sep;28(17):2134-41. **-Other: Study does not adjust via model or participant selection for at**

least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.

995. Maffe S, Paffoni P, Dellavesa P, et al. Role of echocardiographic dyssynchrony parameters in predicting response to cardiac resynchronization therapy. *J Cardiovasc Med (Hagerstown)*. 2015 Nov;16(11):725-35. doi: 10.2459/jcm.000000000000111. PMID: 25004003. - **Addresses only effectiveness, not an RCT**
996. Magne J, Dubois M, Champagne J, et al. Usefulness of NT-pro BNP monitoring to identify echocardiographic responders following cardiac resynchronization therapy. *Cardiovasc Ultrasound*. 2009 2009;7:39 - **Not relevant to Key Questions**
997. Mair H, Sachweh J, Meuris B, et al. Surgical epicardial left ventricular lead versus coronary sinus lead placement in biventricular pacing. *Eur J Cardiothorac Surg*. 2005 2005 Feb;27(2):235-42.-**Other: procedural**
998. Malagoli A, Rossi L, Franchi F, et al. Effect of cardiac resynchronization therapy on left atrial reverse remodeling: role of echocardiographic AV delay optimization. *Int J Cardiol*. 2013 2013 Aug 20;167(4):1456-60 - **Not relevant to Key Questions**
999. Malagoli A, Rossi L, Franchi F, et al. Effect of cardiac resynchronization therapy on left atrial reverse remodeling: role of echocardiographic AV delay optimization. *Int J Cardiol*. 2013 2013 Aug 20;167(4):1456-60. -

Addresses only effectiveness, not an RCT

1000. Malecka B, Zabek A, Maziarz A, et al. Influence of heart failure etiology on the effect of upgrading from right ventricular apical to biventricular or bifocal pacing in patients with permanent atrial fibrillation and advanced heart failure. *Pol Arch Med Wewn*. 2012 2012;122(3):89-97. - **Does not evaluate a CRT**
1001. Malfatto G, Facchini M, Branzi G, et al. Reverse ventricular remodeling and improved functional capacity after ventricular resynchronization in advanced heart failure. *Ital Heart J*. 2005 2005 Jul;6(7):578-83. - **Addresses only effectiveness, not an RCT**
1002. Malfatto G, Facchini M, Branzi G, et al. Reverse ventricular remodeling and improved functional capacity after ventricular resynchronization in advanced heart failure. *Ital Heart J*. 2005 2005 Jul;6(7):578-83. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1003. Man SH, Jeilan M, Siddiqui S, et al. Upgrade to tri-ventricular pacemaker in nonresponders to biventricular cardiac resynchronization therapy: clinical response, mortality and procedural complications at five years. *Europace*. 2015;17:iii197. doi: 10.1093/europace/euv177. PMID: CN-01131346. - **Not full report**
1004. Mandal S, Pande A, Mandal D, et al. Permanent pacemaker-related upper extremity deep vein thrombosis: a series of 20 cases.

- Pacing Clin Electrophysiol. 2012
2012 Oct;35(10):1194-8. -
Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range
1005. Mangiavacchi M, Gasparini M, Faletra F, et al. Clinical predictors of marked improvement in left ventricular performance after cardiac resynchronization therapy in patients with chronic heart failure. Am Heart J. 2006 2006 Feb;151(2):477.e1-e6. -
Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range
1006. Mangiavacchi M, Gasparini M, Genovese S, et al. Insulin-treated type 2 diabetes is associated with a decreased survival in heart failure patients after cardiac resynchronization therapy. Pacing Clin Electrophysiol. 2008 2008 Nov;31(11):1425-32.-**Other: not predictor of interest**
1007. Manne M, Rickard J, Varma N, et al. Normalization of left ventricular ejection fraction after cardiac resynchronization therapy also normalizes survival. Pacing Clin Electrophysiol. 2013 2013 Aug;36(8):970-7.-**Other: Compares CRT to general population**
1008. Manolis AS, Koulouris S, Tsiachris D. Electrophysiology Catheter-Facilitated coronary sinus cannulation and implantation of cardiac resynchronization therapy systems. Hellenic J Cardiol. 2018 Jan - Feb;59(1):26-33. doi: 10.1016/j.hjc.2017.07.008. PMID: 28778735. - **Population inclusion criteria do not fall within the**
- QRS \geq 120ms and LVEF \leq 35% range**
1009. Mansour M, Rasche V, Picard MH, et al. Integration of three-dimensional coronary venous angiography with three-dimensional echocardiography for biventricular device implantation. Heart Rhythm. 2006 2006 Nov;3(11):1391-2. -
Does not evaluate a CRT
1010. Marai I, Gurevitz O, Carasso S, et al. Improvement of congestive heart failure by upgrading of conventional to resynchronization pacemakers. Pacing Clin Electrophysiol. 2006 2006 Aug;29(8):880-4. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1011. Marechaux S, Guiot A, Castel AL, et al. Relationship between Two-Dimensional Speckle-Tracking Septal Strain and Response to Cardiac Resynchronization Therapy in Patients with Left Ventricular Dysfunction and Left Bundle Branch Block: A Prospective Pilot Study. J Am Soc Echocardiogr. 2014 2014 Feb 7 - **Not relevant to Key Questions**
1012. Maréchaux S, Guiot A, Castel AL, et al. Relationship between two-dimensional speckle-tracking septal strain and response to cardiac resynchronization therapy in patients with left ventricular dysfunction and left bundle branch block: A prospective pilot study. Journal of the American Society of Echocardiography. 2014;27(5):501-11. doi: 10.1016/j.echo.2014.01.004 - **Not relevant to Key Questions**

1013. Maréchaux S, Guiot A, Castel AL, et al. Relationship between two-dimensional speckle-tracking septal strain and response to cardiac resynchronization therapy in patients with left ventricular dysfunction and left bundle branch block: A prospective pilot study. *Journal of the American Society of Echocardiography*. 2014;27(5):501-11. doi: 10.1016/j.echo.2014.01.004. - **Does not address outcome of interest**
1014. Marek JJ, Saba S, Onishi T, et al. Usefulness of echocardiographically guided left ventricular lead placement for cardiac resynchronization therapy in patients with intermediate QRS width and non-left bundle branch block morphology. *Am J Cardiol*. 2014 2014 Jan 1;113(1):107-16 - **Not relevant to Key Questions**
1015. Marek JJ, Saba S, Onishi T, et al. Usefulness of echocardiographically guided left ventricular lead placement for cardiac resynchronization therapy in patients with intermediate QRS width and non-left bundle branch block morphology. *American Journal of Cardiology*. 2014;113(1):107-16. doi: 10.1016/j.amjcard.2013.09.024. PMID: 24169014
1016. Marijon E, Leclercq C, Narayanan K, et al. Causes-of-death analysis of patients with cardiac resynchronization therapy: an analysis of the CeRtiTuDe cohort study. *Eur Heart J*. 2015 Nov 1;36(41):2767-76. doi: 10.1093/eurheartj/ehv455. PMID: 26330420. - **Population inclusion criteria do not fall within the**
- QRS \geq 120ms and LVEF \leq 35% range**
1017. Marijon E, Providencia R, Klug D, et al. Risk for non-arrhythmic mortality in "real-life" patients with implantable cardioverter defibrillators in primary prevention. *Circulation*. 2014;130 PMID: CN-01037573. - **Not full report**
1018. Markowitz SM, Lewen JM, Wiggenhorn CJ, et al. Relationship of reverse anatomical remodeling and ventricular arrhythmias after cardiac resynchronization. *J Cardiovasc Electrophysiol*. 2009 2009 Mar;20(3):293-8. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1019. Marques P, Nobre Menezes M, Lima da Silva G, et al. Triple-site pacing for cardiac resynchronization in permanent atrial fibrillation: follow-up results from a prospective observational study. *Europace*. 2018 Jun 1;20(6):986-92. doi: 10.1093/europace/eux036. PMID: 28430960. - **Addresses only effectiveness, not an RCT**
1020. Marques P, Nobre Menezes M, Lima da Silva G, et al. Triple-site pacing for cardiac resynchronization in permanent atrial fibrillation - Acute phase results from a prospective observational study. *Rev Port Cardiol*. 2016 Jun;35(6):331-8. doi: 10.1016/j.repc.2015.12.006. PMID: 27255170. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**

1021. Marsan NA, Bleeker GB, Ypenburg C, et al. Real-time three-dimensional echocardiography as a novel approach to assess left ventricular and left atrium reverse remodeling and to predict response to cardiac resynchronization therapy. *Heart Rhythm*. 2008 2008 Sep;5(9):1257-64. **-Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
1022. Martens P, Jacobs G, Dupont M, et al. Effect of Multi-Disciplinary Cardiac Rehabilitation on the Response to Cardiac Resynchronization Therapy. *Cardiovasc Ther*. 2018 Sep 21:e12467. doi: 10.1111/1755-5922.12467. PMID: 30239134. **- Addresses only effectiveness, not an RCT**
1023. Martens P, Nijst P, Verbrugge FH, et al. Profound differences in prognostic impact of left ventricular reverse remodeling after cardiac resynchronization therapy relate to heart failure etiology. *Heart Rhythm*. 2018 Jan;15(1):130-6. doi: 10.1016/j.hrthm.2017.08.021. PMID: 28843420. **- Does not address outcome of interest**
1024. Martens P, Verbrugge F, Nijst P, et al. Impact of Iron Deficiency on Response to and Remodeling After Cardiac Resynchronization Therapy. *Am J Cardiol*. 2017 Jan 1;119(1):65-70. doi: 10.1016/j.amjcard.2016.09.017. PMID: 27780556. **- Does not address outcome of interest**
1025. Martens P, Verbrugge FH, Nijst P, et al. Feasibility and Association of Neurohumoral Blocker Up-titration After Cardiac Resynchronization Therapy. *J Card Fail*. 2017 Aug;23(8):597-605. doi: 10.1016/j.cardfail.2017.03.001. PMID: 28284756. **- Does not address outcome of interest**
1026. Martens P, Verbrugge FH, Nijst P, et al. Incremental benefit of cardiac resynchronisation therapy with versus without a defibrillator. *Heart*. 2017 Dec;103(24):1977-84. doi: 10.1136/heartjnl-2017-311423. PMID: 28716973. **- Addresses only effectiveness, not an RCT**
1027. Martens P, Verbrugge FH, Nijst P, et al. Mode of Death in Octogenarians Treated With Cardiac Resynchronization Therapy. *J Card Fail*. 2016 Dec;22(12):970-7. doi: 10.1016/j.cardfail.2016.09.023. PMID: 27717763. **- Addresses only effectiveness, not an RCT**
1028. Martignani C, Diemberger I, Nanni C, et al. Cardiac resynchronization therapy and cardiac sympathetic function. *Eur J Clin Invest*. 2015 Aug;45(8):792-9. doi: 10.1111/eci.12471. PMID: 26036750. **- Addresses only effectiveness, not an RCT**
1029. Martin DT, McNitt S, Nesto RW, et al. Cardiac resynchronization therapy reduces the risk of cardiac events in patients with diabetes enrolled in the multicenter automatic defibrillator implantation trial with cardiac resynchronization therapy (MADIT-CRT). *Circ Heart Fail*. 2011 2011 May;4(3):332-8 **- Not relevant to Key Questions**

1030. Martinelli Filho M, de Lima Peixoto G, de Siqueira SF, et al. A cohort study of cardiac resynchronization therapy in patients with chronic Chagas cardiomyopathy. *Europace*. 2018 Mar 2doi: 10.1093/europace/eux375. PMID: 29509903. - **Addresses only effectiveness, not an RCT**
1031. Maruo T, Seo Y, Yamada S, et al. The Speckle Tracking Imaging for the Assessment of Cardiac Resynchronization Therapy (START) study. *Circ J*. 2015;79(3):613-22. doi: 10.1253/circj.CJ-14-0842. PMID: 25746546. - **Does not address outcome of interest**
1032. Marynissen T, Floré V, Heidbuchel H, et al. Heart rate turbulence predicts ICD-resistant mortality in ischaemic heart disease. *Europace*. 2014;16(7):1069-77. doi: 10.1093/europace/eut303. - **Does not evaluate a CRT**
1033. Mascioli G, Curnis A, Bontempi L, et al. Biventricular pacing for patients with severe congestive heart failure: a single center experience. *Ital Heart J*. 2002 Oct;3(10):598-602. - **Addresses only effectiveness, not an RCT**
1034. Mascioli G, Curnis A, Bontempi L, et al. Biventricular pacing for patients with severe congestive heart failure: a single center experience. *Ital Heart J*. 2002 Oct;3(10):598-602. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1035. Mascioli G, Lombardi C, Franceschini F, et al. Effects of immune system status on long-term results of cardiac resynchronization therapy. *Minerva Cardioangiol*. 2015 Dec;63(6):475-82. PMID: 25310692. - **Does not address outcome of interest**
1036. Massoulié G, Sapin V, Ploux S, et al. Low fibrosis biomarker levels predict cardiac resynchronization therapy response. *Sci Rep*. 2019;9(1):6103. doi: 10.1038/s41598-019-42468-4. - **Addresses effectiveness questions only and is not RCT**
1037. Mastenbroek MH, Pedersen SS, Meine M, et al. Distinct trajectories of disease-specific health status in heart failure patients undergoing cardiac resynchronization therapy. *Qual Life Res*. 2016 Jun;25(6):1451-60. doi: 10.1007/s11136-015-1176-3. PMID: 26563250. - **Does not address outcome of interest**
1038. Mastenbroek MH, Van't Sant J, Versteeg H, et al. Relationship Between Reverse Remodeling and Cardiopulmonary Exercise Capacity in Heart Failure Patients Undergoing Cardiac Resynchronization Therapy. *J Card Fail*. 2016 May;22(5):385-94. doi: 10.1016/j.cardfail.2015.08.342. PMID: 26363091. - **Does not address outcome of interest**
1039. Mathew J, Katz R, St John Sutton M, et al. Chronic kidney disease and cardiac remodelling in patients with mild heart failure: results from the REsynchronization reVERses Remodeling in Systolic Left vEntricular Dysfunction

- (REVERSE) study. Eur J Heart Fail. 2012 2012 Dec;14(12):1420-8. **- Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1040. Mathias A, Moss AJ, McNitt S, et al. Clinical Implications of Complete Left-Sided Reverse Remodeling With Cardiac Resynchronization Therapy: A MADIT-CRT Substudy. J Am Coll Cardiol. 2016 Sep 20;68(12):1268-76. doi: 10.1016/j.jacc.2016.06.051. PMID: 27634117. **- Does not address outcome of interest**
1041. Matsumoto K, Tanaka H, Okajima K, et al. Relation between left ventricular morphology and reduction in functional mitral regurgitation by cardiac resynchronization therapy in patients with idiopathic dilated cardiomyopathy. Am J Cardiol. 2011 2011 Nov 1;108(9):1327-34 - **Not relevant to Key Questions**
1042. Mele D, Nardoza M, Malagu M, et al. Left Ventricular Lead Position Guided by Parametric Strain Echocardiography Improves Response to Cardiac Resynchronization Therapy. J Am Soc Echocardiogr. 2017 Oct;30(10):1001-11. doi: 10.1016/j.echo.2017.06.012. PMID: 28822669. **- Addresses only effectiveness, not an RCT**
1043. Mele D, Toselli T, Capasso F, et al. Comparison of myocardial deformation and velocity dyssynchrony for identification of responders to cardiac resynchronization therapy. Eur J Heart Fail. 2009 2009 Apr;11(4):391-9 - **Not relevant to Key Questions**
1044. Melman YF, Shah R, Danielson K, et al. Circulating MicroRNA-30d Is Associated With Response to Cardiac Resynchronization Therapy in Heart Failure and Regulates Cardiomyocyte Apoptosis: A Translational Pilot Study. Circulation. 2015 Jun 23;131(25):2202-16. doi: 10.1161/circulationaha.114.013220. PMID: 25995320. **-Other: looking at mRNA response**
1045. Menardi E, Ballari GP, Goletto C, et al. Characterization of ventricular activation pattern and acute hemodynamics during multipoint left ventricular pacing. Heart Rhythm. 2015 Aug;12(8):1762-9. doi: 10.1016/j.hrthm.2015.04.029. PMID: 25916565. **- Addresses only effectiveness, not an RCT**
1046. Menardi E, Vado A, Rossetti G, et al. Cardiac resynchronization therapy modifies the neurohormonal profile, hemodynamic and functional capacity in heart failure patients. Arch Med Res. 2008 2008 Oct;39(7):702-8. **- Addresses only effectiveness, not an RCT**
1047. Menet A, Bardet-Bouchery H, Guyomar Y, et al. Prognostic importance of postoperative QRS widening in patients with heart failure receiving cardiac resynchronization therapy. Heart Rhythm. 2016 Aug;13(8):1636-43. doi: 10.1016/j.hrthm.2016.05.018. PMID: 27236025. **- Does not address outcome of interest**
1048. Menet A, Bernard A, Tribouilloy C, et al. Clinical significance of septal deformation patterns in heart failure patients

- receiving cardiac resynchronization therapy. *Eur Heart J Cardiovasc Imaging*. 2017 Dec 1;18(12):1388-97. doi: 10.1093/ehjci/jew289. PMID: 28039208. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1049. Menet A, Guyomar Y, Ennezat PV, et al. Prognostic value of left ventricular reverse remodeling and performance improvement after cardiac resynchronization therapy: A prospective study. *Int J Cardiol*. 2016 Feb 1;204:6-11. doi: 10.1016/j.ijcard.2015.11.091. PMID: 26649446. - **Does not address outcome of interest**
1050. Menezes Junior ADS, Lopes CC, Cavalcante PF, et al. Chronic Chagas Cardiomyopathy Patients and Resynchronization Therapy: a Survival Analysis. *Braz J Cardiovasc Surg*. 2018 Jan-Feb;33(1):82-8. doi: 10.21470/1678-9741-2017-0134. PMID: 29617506. - **Does not address outcome of interest**
1051. Merchant FM, Kella D, Book WM, et al. Cardiac resynchronization therapy in adult patients with repaired tetralogy of fallot and left ventricular systolic dysfunction. *PACE Pacing Clin. Electrophysiol*. 2014 2014;37(3):321-8. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1052. Merkely B, Kosztin A, Roka A, et al. Rationale and design of the BUDAPEST-CRT Upgrade Study: a prospective, randomized, multicentre clinical trial. *Europace*. 2017 Sep 1;19(9):1549-55. doi: 10.1093/europace/euw193. PMID: 28339581. - **Not full report**
1053. Merlo M, Pivetta A, Pinamonti B, et al. Long-term prognostic impact of therapeutic strategies in patients with idiopathic dilated cardiomyopathy: changing mortality over the last 30 years. *Eur J Heart Fail*. 2014 2014 Mar;16(3):317-24. - **Not relevant to Key Questions**
1054. Merlo M, Pivetta A, Pinamonti B, et al. Long-term prognostic impact of therapeutic strategies in patients with idiopathic dilated cardiomyopathy: changing mortality over the last 30 years. *Eur J Heart Fail*. 2014 2014 Mar;16(3):317-24. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1055. Michalak M, Cacko A, Stolarz P, et al. Multipoint pacing of the left ventricle to achieve better resynchronisation and clinical response. *Kardiol Pol*. 2016;74(1):84. doi: 10.5603/kp.2016.0011. PMID: 26832813. - **Single case study**
1056. Michalik J, Cacko A, Polinski J, et al. An interactive assistant for patients with cardiac implantable electronic devices: A study protocol of the LUCY trial. *Medicine (Baltimore)*. 2018 Sep;97(39):e12556. doi: 10.1097/md.00000000000012556. PMID: 30278555. - **No original data**
1057. Michelucci A, D'Elis MM, Sticchi E, et al. Autoantibodies against β 1-Adrenergic Receptors:

- Response to Cardiac Resynchronization Therapy and Renal Function. *PACE - Pacing and Clinical Electrophysiology*. 2016;39(1):65-72. doi: 10.1111/pace.12757. - **Does not address outcome of interest**
1058. Michelucci A, D'Elis MM, Sticchi E, et al. Autoantibodies against beta1-Adrenergic Receptors: Response to Cardiac Resynchronization Therapy and Renal Function. *Pacing Clin Electrophysiol*. 2016 Jan;39(1):65-72. doi: 10.1111/pace.12757. PMID: 26411359. - **Addresses only effectiveness, not an RCT**
1059. Michelucci A, Ricciardi G, Sofi F, et al. Relation of inflammatory status to major adverse cardiac events and reverse remodeling in patients undergoing cardiac resynchronization therapy. *J Card Fail*. 2007 2007 Apr;13(3):207-10 - **Not relevant to Key Questions**
1060. Migowski A, Ribeiro AL, Carvalho MS, et al. Seven years of use of implantable cardioverter-defibrillator therapies: A nationwide population-based assessment of their effectiveness in real clinical settings. *BMC Cardiovasc Disord*. 2015;15(1)doi: 10.1186/s12872-015-0016-2. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1061. Mihos CG, Yucel E, Capoulade R, et al. Impact of cardiac resynchronization therapy on mitral valve apparatus geometry and clinical outcomes in patients with secondary mitral regurgitation. *Echocardiography*. 2017 Nov;34(11):1561-7. doi: 10.1111/echo.13690. PMID: 28895197. - **Does not address outcome of interest**
1062. Milliez P, Thomas O, Haggui A, et al. Cardiac resynchronisation as a rescue therapy in patients with catecholamine-dependent overt heart failure: results from a short and mid-term study. *Eur J Heart Fail*. 2008 2008 Mar;10(3):291-7. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1063. Min G, Shaoxin Z, Chang F, et al. Effects of different ventricular pacing modes on ventricular repolarisation in patients undergoing cardiac resynchronisation therapy: a single-centre study. *Heart Lung Circ*. 2014 Jul;23(7):644-8. doi: 10.1016/j.hlc.2014.02.004. PMID: 24713298. - **Addresses only effectiveness, not an RCT**
1064. Minamiguchi H, Sakata Y, Ohtani T, et al. Usefulness of overlapping of the E and A waves of the transmitral flow as a predictor of responders to cardiac resynchronization therapy. *Am J Cardiol*. 2013 2013 Jun 1;111(11):1613-8.-**Other: Not predictor of interest**
1065. Mischke K, Knackstedt C, Fache K, et al. Electrical remodelling in cardiac resynchronization therapy: decrease in intrinsic QRS duration. *Acta Cardiol*. 2011 2011 Apr;66(2):175-80 - **Not relevant to Key Questions**

1066. Mitrani RD, Sager SJ, Moscucci M, et al. Transient variations of transthoracic impedance as a predictor of heart failure and death in patients with implanted defibrillators. *Int J Cardiol.* 2014 Aug 20;175(3):473-7. doi: 10.1016/j.ijcard.2014.06.019. PMID: 25012496 - **Not relevant to Key Questions**
1067. Mitrani RD, Sager SJ, Moscucci M, et al. Transient variations of transthoracic impedance as a predictor of heart failure and death in patients with implanted defibrillators. *Int J Cardiol.* 2014 Aug 20;175(3):473-7. doi: 10.1016/j.ijcard.2014.06.019. PMID: 25012496. - **Does not address outcome of interest**
1068. Mitro P, Murin P, Valocik G, et al. Regional myocardial contractile reserve assessed by strain echocardiography and the response to cardiac resynchronization therapy. *Cardiol J.* 2014;21(5):524-31. doi: 10.5603/CJ.a2014.0003. PMID: 24526506. - **Does not address outcome of interest**
1069. Mittal S, Aktas MK, Moss AJ, et al. The impact of nonsustained ventricular tachycardia on reverse remodeling, heart failure, and treated ventricular tachyarrhythmias in MADIT-CRT. *J Cardiovasc Electrophysiol.* 2014 Oct;25(10):1082-7. doi: 10.1111/jce.12456. PMID: 24862906 - **Not relevant to Key Questions**
1070. Mittal S, Aktas MK, Moss AJ, et al. The impact of nonsustained ventricular tachycardia on reverse remodeling, heart failure, and treated ventricular tachyarrhythmias in MADIT-CRT. *J Cardiovasc Electrophysiol.* 2014 Oct;25(10):1082-7. doi: 10.1111/jce.12456. PMID: 24862906. - **Addresses only effectiveness, not an RCT**
1071. Mittal S, Musat DL, Hoskins MH, et al. Clinical Outcomes After Ablation of the AV Junction in Patients With Atrial Fibrillation: Impact of Cardiac Resynchronization Therapy. *J Am Heart Assoc.* 2017 Nov 27;6(12)doi: 10.1161/jaha.117.007270. PMID: 29180458. - **Addresses only effectiveness, not an RCT**
1072. Mittal S, Piccini JP, Snell J, et al. Improved survival in patients enrolled promptly into remote monitoring following cardiac implantable electronic device implantation. *J Interv Card Electrophysiol.* 2016 Aug;46(2):129-36. doi: 10.1007/s10840-016-0112-y. PMID: 26860839. - **Does not address outcome of interest**
1073. Mittal S, Shaw RE, Michel K, et al. Cardiac implantable electronic device infections: Incidence, risk factors, and the effect of the AigisRx antibacterial envelope. *Heart Rhythm.* 2014 2014 Apr;11(4):595-601 - **Not relevant to Key Questions**
1074. Mittal S, Shaw RE, Michel K, et al. Cardiac implantable electronic device infections: Incidence, risk factors, and the effect of the AigisRx antibacterial envelope. *Heart Rhythm.* 2014 2014

- Apr;11(4):595-601. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1075. Miyata M, Yoshihisa A, Suzuki S, et al. Adaptive servo ventilation improves Cheyne-Stokes respiration, cardiac function, and prognosis in chronic heart failure patients with cardiac resynchronization therapy. *J Cardiol.* 2012 2012 Sep;60(3):222-7 - **Not relevant to Key Questions**
1076. Miyazaki A, Negishi J, Hayama Y, et al. Evaluating the response to cardiac resynchronization therapy performed with a new ventricular morphology-based strategy for congenital heart disease. *Heart Vessels.* 2019((Miyazaki A., ayamiya@pc4.so-net.ne.jp; Doi H.) Congenital Heart Disease Center, Tenri Hospital, 200 Mishima-cho, Tenri, Nara, Japan)doi: 10.1007/s00380-019-01369-2. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1077. Miyazaki C, Redfield MM, Powell BD, et al. Dyssynchrony indices to predict response to cardiac resynchronization therapy: a comprehensive prospective single-center study. *Circ Heart Fail.* 2010 2010 Sep;3(5):565-73 - **Not relevant to Key Questions**
1078. Mizia-Stec K, Wita K, Mizia M, et al. Preserved contractile reserve in a dobutamine test for the prediction of a response to resynchronisation therapy in ischaemic and non-ischaemic cardiomyopathy - A multicenter ViaCRT study. *Int J Cardiol.* 2014 2014 Mar 15;172(2):476-7 - **Not relevant to Key Questions**
1079. Mlynarska A, Mlynarski R, Biernat J, et al. Frailty Syndrome in Heart Failure Patients who are Receiving Cardiac Resynchronization. *Pacing Clin Electrophysiol.* 2016 Apr;39(4):370-4. doi: 10.1111/pace.12800. PMID: 26681366. - **Addresses only effectiveness, not an RCT**
1080. Mlynarska A, Mlynarski R, Golba KS. Frailty as a predictor of negative outcomes after cardiac resynchronization therapy. *Pacing Clin Electrophysiol.* 2018 Jun;41(6):572-7. doi: 10.1111/pace.13329. PMID: 29577339. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1081. Mochizuki Y, Tanaka H, Tatsumi K, et al. Easy-to-use comprehensive speckle-tracking approach for cardiac resynchronization therapy. *Circulation Journal.* 2014;78(9):2250-8. doi: 10.1253/circj.CJ-14-0114. - **Addresses only effectiveness, not an RCT**
1082. Modi S, Yee R, Scholl D, et al. Ventricular pacing site separation by cardiac computed tomography: validation for the prediction of clinical response to cardiac resynchronization therapy. *Int J Cardiovasc Imaging.* 2017 Sep;33(9):1433-42. doi: 10.1007/s10554-017-1120-4.

- PMID: 28357725. - **Does not address outcome of interest**
1083. Molhoek SG, Bax JJ, Bleeker GB, et al. Comparison of response to cardiac resynchronization therapy in patients with sinus rhythm versus chronic atrial fibrillation. *Am J Cardiol.* 2004 2004 Dec 15;94(12):1506-9. - **Addresses only effectiveness, not an RCT**
1084. Molhoek SG, Bax JJ, Bleeker GB, et al. Long-term follow-up of cardiac resynchronization therapy in patients with end-stage heart failure. *J Cardiovasc Electrophysiol.* 2005 2005 Jul;16(7):701-7. - **Addresses only effectiveness, not an RCT**
1085. Mollo R, Cosenza A, Coviello I, et al. A novel electrocardiographic predictor of clinical response to cardiac resynchronization therapy. *Europace.* 2013 2013 Nov;15(11):1615-21. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1086. Momomura S, Tsutsui H, Sugawara Y, et al. Clinical efficacy of cardiac resynchronization therapy with an implantable defibrillator in a Japanese population: results of the MIRACLE-ICD outcome measured in Japanese indication (MOMIJI) study. *Circ J.* 2012 2012;76(8):1911-9 - **Not relevant to Key Questions**
1087. Monnier A, Lesaffre F, Chabert JP, et al. Implantable cardioverter defibrillator in primary prevention for chronic heart failure: incidence and predictors of appropriate therapy. *Archives of cardiovascular diseases supplements.* 2016;8(1 SUPPL. 1):74. PMID: CN-01174619. - **Not full report**
1088. Moore JP, Cho D, Lin JP, et al. Implantation techniques and outcomes after cardiac resynchronization therapy for congenitally corrected transposition of the great arteries. *Heart Rhythm.* 2018 Aug 18doi: 10.1016/j.hrthm.2018.08.017. PMID: 30125719. - **Does not address outcome of interest**
1089. Moore K, Ganesan A, Labrosciano C, et al. Sex differences in acute complications of cardiac implantable electronic devices: Implications for patient safety. *J Am Heart Assoc.* 2019;8(2)doi: 10.1161/jaha.118.010869. - **Does not address outcome of interest**
1090. Mooyaart EA, Marsan NA, van Bommel RJ, et al. Comparison of long-term survival of men versus women with heart failure treated with cardiac resynchronization therapy. *Am J Cardiol.* 2011 2011 Jul 1;108(1):63-8. - **Addresses only effectiveness, not an RCT**
1091. Morales MA, Startari U, Rossi G, et al. Reverse left ventricular remodeling is more likely in non ischemic cardiomyopathy patients upgraded to biventricular stimulation after chronic right ventricular pacing. *Cardiovasc Ultrasound.* 2011 2011;9:41 - **Not relevant to Key Questions**
1092. Moreira RI, Abreu A, Portugal G, et al. Prognostic effect and modulation of cardiac sympathetic function in heart failure patients

- treated with cardiac resynchronization therapy. *J Nucl Cardiol.* 2018 Jul 10doi: 10.1007/s12350-018-1357-x. PMID: 29992524. - **Does not address outcome of interest**
1093. Moreira RI, Cunha PS, Rio P, et al. Response and outcomes of cardiac resynchronization therapy in patients with renal dysfunction. *J Interv Card Electrophysiol.* 2018 Apr;51(3):237-44. doi: 10.1007/s10840-018-0330-6. PMID: 29460235. - **Addresses only effectiveness, not an RCT**
1094. Morgan JM, Biffi M, Geller L, et al. ALternate Site Cardiac ResYNChronization (ALSYNC): a prospective and multicentre study of left ventricular endocardial pacing for cardiac resynchronization therapy. *Eur Heart J.* 2016 Jul 14;37(27):2118-27. doi: 10.1093/eurheartj/ehv723. PMID: 26787437. - **Addresses only effectiveness, not an RCT**
1095. Morimoto Y, Nishii N, Tsukuda S, et al. A Low Critical Event Rate Despite A High Abnormal Event Rate in Patients with Cardiac Implantable Electric Devices Followed Up by Remote Monitoring. *Intern Med.* 2019 May 22doi: 10.2169/internalmedicine.1905-18. PMID: 31118368. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1096. Morishima I, Okumura K, Tsuboi H, et al. Impact of basal inferolateral scar burden determined by automatic analysis of ^{99m}Tc -MIBI myocardial perfusion SPECT on the long-term prognosis of cardiac resynchronization therapy. *Europace.* 2017 Apr 1;19(4):573-80. doi: 10.1093/europace/euw068. PMID: 28431062. - **Addresses only effectiveness, not an RCT**
1097. Moss AJ, Daubert J, Zareba W. MADIT-II: clinical implications. *Card Electrophysiol Rev.* 2002 Dec;6(4):463-5. - **Does not evaluate a CRT**
1098. Moss AJ, Daubert J, Zareba W. MADIT-II: clinical implications. *Card Electrophysiol Rev.* 2002 Dec;6(4):463-5. - **No original data**
1099. Muellerleile K, Baholli L, Groth M, et al. Quantification of mechanical ventricular dyssynchrony: direct comparison of velocity-encoded and cine magnetic resonance imaging. *Rofo.* 2011 Jun;183(6):554-60 - **Not relevant to Key Questions**
1100. Muellerleile K, Baholli L, Groth M, et al. Quantification of mechanical ventricular dyssynchrony: direct comparison of velocity-encoded and cine magnetic resonance imaging. *Rofo.* 2011 Jun;183(6):554-60. - **Addresses only effectiveness, not an RCT**
1101. Mukherjee A, Patel CD, Naik N, et al. Quantitative assessment of cardiac mechanical dyssynchrony and prediction of response to cardiac resynchronization therapy in patients with nonischaemic dilated cardiomyopathy using gated myocardial perfusion SPECT. *Nucl Med Commun.*

- 2015 May;36(5):494-501. doi: 10.1097/mnm.0000000000000282 . PMID: 25695610. - **Does not address outcome of interest**
1102. Mukherjee A, Patel CD, Naik N, et al. Quantitative assessment of cardiac mechanical dyssynchrony and prediction of response to cardiac resynchronization therapy in patients with non-ischaemic dilated cardiomyopathy using equilibrium radionuclide angiography. *Europace*. 2016 Jun;18(6):851-7. doi: 10.1093/europace/euv145. PMID: 26056184. - **Addresses only effectiveness, not an RCT**
1103. Mukherjee A, Patel CD, Roy A, et al. Interplay between right ventricular mechanical dyssynchrony and cardiac resynchronization therapy in patients with nonischemic dilated cardiomyopathy. *Nucl Med Commun*. 2016 Oct;37(10):1016-23. doi: 10.1097/mnm.0000000000000555 . PMID: 27295307. - **Does not address outcome of interest**
1104. Munir MB, Althouse AD, Rijal S, et al. Clinical Characteristics and Outcomes of Older Cardiac Resynchronization Therapy Recipients Using a Pacemaker versus a Defibrillator. *J Cardiovasc Electrophysiol*. 2016 Jun;27(6):730-4. doi: 10.1111/jce.12951. PMID: 26856440. - **Addresses only effectiveness, not an RCT**
1105. Murin P, Mitro P, Valocik G, et al. Global myocardial contractile reserve assessed by high-dose dobutamine stress echocardiography predicts response to the cardiac resynchronization therapy. *Echocardiography*. 2015 Mar;32(3):490-5. doi: 10.1111/echo.12694. PMID: 25059770. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1106. Muto C, Gasparini M, Neja CP, et al. Presence of left ventricular contractile reserve predicts midterm response to cardiac resynchronization therapy--results from the LOw dose DObutamine stress-echo test in Cardiac Resynchronization Therapy (LODO-CRT) trial. *Heart Rhythm*. 2010 2010 Nov;7(11):1600-5.-**Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
1107. Muto C, Solimene F, Gallo P, et al. A randomized study of cardiac resynchronization therapy defibrillator versus dual-chamber implantable cardioverter-defibrillator in ischemic cardiomyopathy with narrow QRS: the NARROW-CRT study. *Circ Arrhythm Electrophysiol*. 2013 2013 Jun;6(3):538-45. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1108. Muto C, Solimene F, Gallo P, et al. Cardiac resynchronization therapy in ischemic patients with narrow QRS: the narrow-CRT study. *Europace*. 2013;15:ii254. doi: 10.1093/europace/eut202.

- PMID: CN-01025740. – **Not full report**
1109. Muto C, Solimene F, Russo V, et al. Optimal left ventricular lead placement for cardiac resynchronization therapy in postmyocardial infarction patients. *Future Cardiol.* 2018 May 1;14(3):215-24. doi: 10.2217/fca-2017-0046. PMID: 29767542. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1110. Muxi A, Paredes P, Mont L, et al. Left ventricular function and visual phase analysis with equilibrium radionuclide angiography in patients with biventricular device. *Eur J Nucl Med Mol Imaging.* 2008 2008 May;35(5):912-21 - **Not relevant to Key Questions**
1111. Muxi A, Paredes P, Mont L, et al. Left ventricular function and visual phase analysis with equilibrium radionuclide angiography in patients with biventricular device. *Eur J Nucl Med Mol Imaging.* 2008 2008 May;35(5):912-21. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1112. Nabeta T, Inomata T, Iida Y, et al. Prognostic significance of beta-blocker up-titration in conjunction with cardiac resynchronization therapy in heart failure management. *Heart Vessels.* 2016 Jul;31(7):1109-16. doi: 10.1007/s00380-015-0711-z. PMID: 26253941. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1113. Naegeli B, Brunner-La Rocca HP, Attenhofer Jost C, et al. Clinical Long-Term Response to Cardiac Resynchronization Therapy Is Independent of Persisting Echocardiographic Markers of Dyssynchrony. *Cardiol Res.* 2014 Dec;5(6):163-70. doi: 10.14740/cr368w. PMID: 28352448. - **Addresses only effectiveness, not an RCT**
1114. Nagele H, Azizi M, Castel MA. Hemodynamic changes during cardiac resynchronization therapy. *Clin Cardiol.* 2007 2007 Mar;30(3):141-3 - **Not relevant to Key Questions**
1115. Nagele H, Azizi M, Castel MA. Hemodynamic changes during cardiac resynchronization therapy. *Clin Cardiol.* 2007 2007 Mar;30(3):141-3. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1116. Nagele H, Behrens S, Azizi M. What can happen during coronary sinus lead implantation: dislocation, perforation and other catastrophes. *Herzschrittmacherther Elektrophysiol.* 2007 2007 Dec;18(4):243-9. – **No original data**
1117. Nagele H, Dodeck J, Behrens S, et al. Hemodynamics and prognosis after primary cardiac resynchronization system implantation compared to "upgrade" procedures. *Pacing Clin Electrophysiol.* 2008 2008 Oct;31(10):1265-71. - **Other:**

- Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
1118. Nagele H, Hashagen S, Azizi M, et al. Long-term hemodynamic benefit of biventricular pacing depending on coronary sinus lead position. *Herzschrittmacherther Elektrophysiol.* 2006 2006 Dec;17(4):185-90. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1119. Nagele MP, Steffel J, Robertson M, et al. Effect of cardiac resynchronization therapy in patients with diabetes randomized in EchoCRT. *Eur J Heart Fail.* 2017 Jan;19(1):80-7. doi: 10.1002/ejhf.655. PMID: 27862715. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1120. Nagy KV, Szeplaki G, Perge P, et al. Quality of life measured with EuroQol-five dimensions questionnaire predicts long-term mortality, response, and reverse remodelling in cardiac resynchronization therapy patients. *Europace.* 2018 Sep 1;20(9):1506-12. doi: 10.1093/europace/eux342. PMID: 29182734. - **Addresses only effectiveness, not an RCT**
1121. Nagy VK, Szeplaki G, Apor A, et al. Role of Right Ventricular Global Longitudinal Strain in Predicting Early and Long-Term Mortality in Cardiac Resynchronization Therapy Patients. *PLoS One.* 2015;10(12):e0143907. doi: 10.1371/journal.pone.0143907. PMID: 26700308. - **Addresses only effectiveness, not an RCT**
1122. Naik A, Singh B, Yadav R, et al. Cardiac resynchronization therapy is associated with improvement in clinical outcomes in Indian heart failure patients: Results of a large, long-term observational study. *Indian Heart J.* 2018((Naik A.) Care Institute of Medical Sciences, Ahmedabad, India)doi: 10.1016/j.ihj.2018.07.010. - **Addresses only effectiveness, not an RCT**
1123. Najem B, Preumont N, Unger P, et al. Sympathetic nerve activity after thoracoscopic cardiac resynchronization therapy in congestive heart failure. *J Card Fail.* 2005 2005 Sep;11(7):529-33. - **Addresses only effectiveness, not an RCT**
1124. Najem B, Unger P, Preumont N, et al. Sympathetic control after cardiac resynchronization therapy: responders versus nonresponders. *Am J Physiol Heart Circ Physiol.* 2006 2006 Dec;291(6):H2647-52 - **Not relevant to Key Questions**
1125. Nakamura K, Takami M, Shimabukuro M, et al. Effective prediction of response to cardiac resynchronization therapy using a novel program of gated myocardial perfusion single photon emission computed tomography. *Europace.* 2011 2011 Dec;13(12):1731-7 - **Not relevant to Key Questions**

1126. Nakasuka K, Ishibashi K, Hattori Y, et al. Gender difference on the efficacy of cardiac resynchronization therapy in patients with cardiac sarcoidosis—from Japanese multi-center retrospective cohort analysis. *Heart rhythm*. Conference: 38th annual scientific sessions of the heart rhythm society, heart rhythm 2017. United states. 2017;14(5 Supplement 1):S400-S1. PMID: CN-01400246. – **Not full report**
1127. Nascimento EAD, Reis CCW, Ribeiro FB, et al. Relationship of Electromechanical Dyssynchrony in Patients Submitted to CRT With LV Lead Implantation Guided by Gated Myocardial Perfusion Spect. *Arq Bras Cardiol*. 2018 Aug 23doi: 10.5935/abc.20180159. PMID: 30156606. - **Does not address outcome of interest**
1128. Nassif ME, Tang Y, Cleland JG, et al. Precision Medicine for Cardiac Resynchronization: Predicting Quality of Life Benefits for Individual Patients—An Analysis From 5 Clinical Trials. *Circ Heart Fail*. 2017 Oct;10(10)doi: 10.1161/circheartfailure.117.004111. PMID: 29038172. – **No original data**
1129. Nauffal V, Tanawuttiwat T, Zhang Y, et al. Predictors of mortality, LVAD implant, or heart transplant in primary prevention cardiac resynchronization therapy recipients: The HF-CRT score. *Heart Rhythm*. 2015 Dec;12(12):2387-94. doi: 10.1016/j.hrthm.2015.07.026. PMID: 26190316. - **Addresses only effectiveness, not an RCT**
1130. Nauffal V, Zhang Y, Tanawuttiwat T, et al. Clinical decision tool for CRT-P vs. CRT-D implantation: Findings from PROSE-ICD. *PLoS One*. 2017;12(4)doi: 10.1371/journal.pone.0175205. PMID: 28388657. - **Addresses only effectiveness, not an RCT**
1131. Nawar A, Samy W, Elaasar H, et al. Usefulness of plasma B type natriuretic peptide as a predictor to identify responders following CRT. *Egyptian Journal of Critical Care Medicine*. 2016;4(2):97-103. doi: 10.1016/j.ejccm.2016.05.003. - **Does not address outcome of interest**
1132. Nayak HM, Verdino RJ, Russo AM, et al. Ventricular tachycardia storm after initiation of biventricular pacing: incidence, clinical characteristics, management, and outcome. *J Cardiovasc Electrophysiol*. 2008 Jul;19(7):708-15. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1133. Nayyar S, Suszko A, Porta-Sanchez A, et al. Reduced T wave alternans in heart failure responders to cardiac resynchronization therapy: Evidence of electrical remodeling. *PLoS One*. 2018;13(6):e0199637. doi: 10.1371/journal.pone.0199637. PMID: 29953465. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**

1134. Nazeri A, Massumi A, Rasekh A, et al. Cardiac resynchronization therapy in patients with right ventricular pacing-induced cardiomyopathy. *Pacing Clin Electrophysiol.* 2010 2010 Jan;33(1):37-40 - **Not relevant to Key Questions**
1135. Nazeri A, Massumi A, Rasekh A, et al. Cardiac resynchronization therapy may improve symptoms of congestive heart failure in patients without electrical or mechanical dyssynchrony. *Europace.* 2009 2009 Jan;11(1):86-8 - **Not relevant to Key Questions**
1136. Nazeri A, Massumi A, Rasekh A, et al. Cardiac resynchronization therapy may improve symptoms of congestive heart failure in patients without electrical or mechanical dyssynchrony. *Europace.* 2009 2009 Jan;11(1):86-8. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1137. Nct. Electrophysiological Optimization of Left Ventricular Lead Placement in CRT. <https://clinicaltrials.gov/show/nct02346097>. 2015 PMID: CN-01575771. – **Not full report**
1138. Nct. MOre REsponse on Cardiac Resynchronization Therapy With MultiPoint Pacing. <https://clinicaltrials.gov/show/nct02006069>. 2013 PMID: CN-01593894. -**Other: prior review**
1139. Nelson TA, Bhakta A, Lee J, et al. Evaluation of a new same-day discharge protocol for simple and complex pacing procedures. *British Journal of Cardiology.* 2016;23(3):114-8. doi: 10.5837/bjc.2016.029. - **Does not address outcome of interest**
1140. Nemetlu E, Zhang S, Xu YZ, et al. Cardiac resynchronization therapy induces adaptive metabolic transitions in the metabolomic profile of heart failure. *J Card Fail.* 2015 Jun;21(6):460-9. doi: 10.1016/j.cardfail.2015.04.005. PMID: 25911126. - **Does not evaluate a CRT**
1141. Nguyễn UC, Claridge S, Vernoooy K, et al. Relationship between vectorcardiographic QRSarea, myocardial scar quantification, and response to cardiac resynchronization therapy. *J Electrocardiol.* 2018;51(3):457-63. doi: 10.1016/j.jelectrocard.2018.01.009. PMID: 29454649
1142. Nguyen UC, Mafi-Rad M, Aben JP, et al. A novel approach for left ventricular lead placement in cardiac resynchronization therapy: Intraprocedural integration of coronary venous electroanatomic mapping with delayed enhancement cardiac magnetic resonance imaging. *Heart Rhythm.* 2017 Jan;14(1):110-9. doi: 10.1016/j.hrthm.2016.09.015. PMID: 27663606. - **Does not address outcome of interest**
1143. Niazi I, Baker J, 2nd, Corbisiero R, et al. Safety and Efficacy of Multipoint Pacing in Cardiac Resynchronization Therapy: The MultiPoint Pacing Trial. *JACC Clin Electrophysiol.* 2017 Dec 26;3(13):1510-8. doi: 10.1016/j.jacep.2017.06.022.

- PMID: 29759832. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1144. Niazi I, Choudhuri I, Dhala A, et al. Biventricular pacing using two left ventricular leads compared to standard cardiac resynchronization therapy: a prospective randomized trial. Heart rhythm. 2013;10(5 SUPPL. 1):S112. PMID: CN-01027244. - **Not full report**
1145. Nichol G, Kaul P, Huszti E, et al. Cost-effectiveness of cardiac resynchronization therapy in patients with symptomatic heart failure. Ann Intern Med. 2004 2004 Sep 7;141(5):343-51 - **Not relevant to Key Questions**
1146. Niebauer MJ, Rickard J, Tchou PJ, et al. Early Changes in QRS Frequency Following Cardiac Resynchronization Predict Hemodynamic Response in Left Bundle Branch Block Patients. J Cardiovasc Electrophysiol. 2016 May;27(5):594-9. doi: 10.1111/jce.12939. PMID: 26824741. - **Does not address outcome of interest**
1147. Nielsen JC, Botcher M, Jensen HK, et al. Regional myocardial perfusion during chronic biventricular pacing and after acute change of the pacing mode in patients with congestive heart failure and bundle branch block treated with an atrioventricular sequential biventricular pacemaker. Eur J Heart Fail. 2003 2003 Mar;5(2):179-86 - **Not relevant to Key Questions**
1148. Nishimura RA, Hayes DL, Holmes DRJ, et al. Mechanism of hemodynamic improvement by dual-chamber pacing for severe left ventricular dysfunction: an acute Doppler and catheterization hemodynamic study. J Am Coll Cardiol. 1995 1995 Feb;25(2):281-8. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1149. Nitsche B, Eitel C, Bode K, et al. Left ventricular wall motion analysis to guide management of CRT non-responders. Europace. 2015 May;17(5):778-86. doi: 10.1093/europace/euv034. PMID: 25825461. - **Does not address outcome of interest**
1150. Nobre TS, Antunes-Correa LM, Groehs RV, et al. Exercise training improves neurovascular control and calcium cycling gene expression in patients with heart failure with cardiac resynchronization therapy. Am J Physiol Heart Circ Physiol. 2016 Nov 1;311(5):H1180-H8. doi: 10.1152/ajpheart.00275.2016. PMID: 27591218. - **Does not address outcome of interest**
1151. Noda T, Kurita T, Nitta T, et al. Appropriate duration of driving restrictions after inappropriate therapy from implantable cardiac shock devices - Interim analysis of the Nippon Storm Study. Circulation Journal. 2014;78(8):1989-91. doi: 10.1253/circj.CJ-14-0589 - **Not relevant to Key Questions**
1152. Nof E, Gurevitz O, Carraso S, et al. Comparison of results with different left ventricular pacing

- leads. *Europace*. 2008 2008 Jan;10(1):35-9. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1153. Nordbeck P, Seidl B, Fey B, et al. Effect of cardiac resynchronization therapy on the incidence of electrical storm. *Int J Cardiol*. 2010 2010 Sep 3;143(3):330-6 - **Not relevant to Key Questions**
1154. Nordbeck P, Seidl B, Fey B, et al. Effect of cardiac resynchronization therapy on the incidence of electrical storm. *Int J Cardiol*. 2010 2010 Sep 3;143(3):330-6. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1155. Normand C, Linde C, Bogale N, et al. Cardiac resynchronization therapy pacemaker or cardiac resynchronization therapy defibrillator: what determines the choice?-findings from the ESC CRT Survey II. *Europace*. 2019;21(6):918-27. doi: 10.1093/europace/euz002. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1156. Novak M, Lipoldova J, Kamaryt P, et al. Cardiac resynchronization therapy. Midterm follow-up of 128 patients. *Bratisl Lek Listy*. 2007 2007;108(10-11):445-52. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1157. Noyes K, Corona E, Veazie P, et al. Examination of the effect of implantable cardioverter-defibrillators on health-related quality of life: based on results from the Multicenter Automatic Defibrillator Trial-II. *Am J Cardiovasc Drugs*. 2009 2009;9(6):393-400. - **Does not evaluate a CRT**
1158. O'Coirlain B, Delurgio D, Leon A, et al. The effect of variation in the interval between right and left ventricular activation on paced QRS duration. *Pacing Clin Electrophysiol*. 2001 2001 Dec;24(12):1780-2 - **Not relevant to Key Questions**
1159. O'Connell JW, Schreck C, Moles M, et al. A unique method by which to quantitate synchrony with equilibrium radionuclide angiography. *J Nucl Cardiol*. 2005 2005 Jul-Aug;12(4):441-50. - **Does not evaluate a CRT**
1160. O'Connell JW, Schreck C, Moles M, et al. A unique method by which to quantitate synchrony with equilibrium radionuclide angiography. *J Nucl Cardiol*. 2005 2005 Jul-Aug;12(4):441-50 - **Not relevant to Key Questions**
1161. Oddone D, Solari D, Arena G, et al. Optimization of coronary sinus lead placement targeted to right-to-left delay in patients undergoing cardiac resynchronization therapy. *Europace*. 2019;21(3):502-10. doi: 10.1093/europace/euy275. - **Addresses effectiveness questions only and is not RCT**
1162. Oddone D, Solari D, Nangah R, et al. Optimization of coronary sinus lead placement targeted to the longest right-to-left delay in patients undergoing cardiac

- resynchronization therapy: The Optimal Pacing SITE 2 (OPSITE 2) acute study and protocol. *Pacing Clin Electrophysiol.* 2017 Dec;40(12):1350-7. doi: 10.1111/pace.13212. PMID: 29023821. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1163. Ogano M, Iwasaki YK, Tanabe J, et al. Cardiac resynchronization therapy restored ventricular septal myocardial perfusion and enhanced ventricular remodeling in patients with nonischemic cardiomyopathy presenting with left bundle branch block. *Heart Rhythm.* 2014 Feb 19 - **Not relevant to Key Questions**
1164. Ogawa K, Yoshida K, Uehara Y, et al. Mechanistic implication of decreased plasma atrial natriuretic peptide level for transient rise in the atrial capture threshold early after ICD or CRT-D implantation. *J Interv Card Electrophysiol.* 2018 Oct;53(1):131-40. doi: 10.1007/s10840-018-0409-0. PMID: 30019272. - **Does not address outcome of interest**
1165. Oginosawa Y, Kohno R, Honda T, et al. Superior rhythm discrimination with the smartshock technology algorithm — results of the implantable defibrillator with enhanced features and settings for reduction of inaccurate detection (DEFENSE) trial —. *Circulation Journal.* 2017;81(9):1272-7. doi: 10.1253/circj.CJ-16-1330. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1166. Oginosawa Y, Nogami A, Soejima K, et al. Effect of cardiac resynchronization therapy in isolated ventricular noncompaction in adults: follow-up of four cases. *J Cardiovasc Electrophysiol.* 2008 Sep;19(9):935-8. – **Single case study**
1167. Oh C, Chang HJ, Sung JM, et al. Prognostic Estimation of Advanced Heart Failure With Low Left Ventricular Ejection Fraction and Wide QRS Interval. *Korean Circ J.* 2012 Oct;42(10):659-67. - **Does not evaluate a CRT**
1168. Ohkusu Y, Takahashi N, Ishikawa T, et al. Effect of biventricular pacing on myocardial glucose metabolism in patients with heart failure using fluoro-18-deoxyglucose positron emission tomography. *Pacing Clin Electrophysiol.* 2003 Jan;26(1 Pt 2):144-7. - **Addresses only effectiveness, not an RCT**
1169. Oka T, Inoue K, Tanaka K, et al. Duration of reverse remodeling response to cardiac resynchronization therapy: Rates, predictors, and clinical outcomes. *Int J Cardiol.* 2017 Sep 15;243:340-6. doi: 10.1016/j.ijcard.2017.05.058. PMID: 28545852. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1170. Oka T, Inoue K, Tanaka K, et al. Effect of QRS Morphology and Duration on Clinical Outcomes After Cardiac Resynchronization Therapy- Analysis of Japanese Multicenter Registry. *Circ J.* 2018

- Jun 25;82(7):1813-21. doi: 10.1253/circj.CJ-17-1383. PMID: 29628460. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1171. Okada JI, Washio T, Nakagawa M, et al. Multi-scale, tailor-made heart simulation can predict the effect of cardiac resynchronization therapy. *J Mol Cell Cardiol.* 2017 Jul;108:17-23. doi: 10.1016/j.yjmcc.2017.05.006. PMID: 28502795. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1172. Okutucu S, Jam F, Sabanoglu C, et al. Fingertip reactive hyperemia peripheral arterial tonometry score predicts response to biventricular pacing. *Acta Cardiol Sin.* 2018;34(6):488-95. doi: 10.6515/acs.201811_34(6).20180518a. - **Addresses effectiveness questions only and is not RCT**
1173. Olechowski B, Sands R, Zachariah D, et al. Is cardiac resynchronisation therapy feasible, safe and beneficial in the very elderly? *J Geriatr Cardiol.* 2015 Sep;12(5):497-501. doi: 10.11909/j.issn.1671-5411.2015.05.003. PMID: 26512240. - **Does not address outcome of interest**
1174. Olshansky B, Richards M, Sharma A, et al. Survival After Rate-Responsive Programming in Patients With Cardiac Resynchronization Therapy-Defibrillator Implants Is Associated With a Novel Parameter: The Heart Rate Score. *Circ Arrhythm Electrophysiol.* 2016 Aug;9(8)doi: 10.1161/circep.115.003806. PMID: 27516461. - **Does not address outcome of interest**
1175. Ortigosa N, Perez-Rosello V, Donoso V, et al. Early prediction of cardiac resynchronization therapy response by non-invasive electrocardiogram markers. *Med Biol Eng Comput.* 2018 Apr;56(4):611-21. doi: 10.1007/s11517-017-1711-1. PMID: 28840451. - **Does not address outcome of interest**
1176. Oswald H, Asbach S, Kobe J, et al. Effectiveness and Reliability of Selected Site Pacing for Avoidance of Phrenic Nerve Stimulation in CRT Patients with Quadripolar LV Leads: The EffaceQ Study. *Pacing Clin Electrophysiol.* 2015 Aug;38(8):942-50. doi: 10.1111/pace.12664. PMID: 25974406. - **Addresses only effectiveness, not an RCT**
1177. Ousdigian KT, Borek PP, Koehler JL, et al. The epidemic of inadequate biventricular pacing in patients with persistent or permanent atrial fibrillation and its association with mortality. *Circ Arrhythm Electrophysiol.* 2014 Jun;7(3):370-6. doi: 10.1161/circep.113.001212. PMID: 24838004 - **Not relevant to Key Questions**
1178. Ousdigian KT, Borek PP, Koehler JL, et al. The epidemic of inadequate biventricular pacing in patients with persistent or permanent atrial fibrillation and its association with mortality. *Circ Arrhythm Electrophysiol.* 2014 Jun;7(3):370-6. doi:

- 10.1161/circep.113.001212.
PMID: 24838004. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1179. Ozbaran M, Yagdi T, Engin C, et al. Left ventricular assist device implantation with left lateral thoracotomy with anastomosis to the descending aorta. *Interact Cardiovasc Thorac Surg*. 2018 Aug 1;27(2):186-90. doi: 10.1093/icvts/ivy061. PMID: 29554252. - **Addresses only effectiveness, not an RCT**
1180. Padeletti L, Aimo A, Vishnevsky B, et al. The prognostic benefit of cardiac resynchronization therapy is greater in concordant vs. discordant left bundle branch block in the Multicenter Automatic Defibrillator Implantation Trial-Cardiac Resynchronization Therapy (MADIT-CRT). *Europace*. 2018 May 1;20(5):794-800. doi: 10.1093/europace/euw446. PMID: 28398490. - **Does not address outcome of interest**
1181. Padeletti L, Brachmann J, Brugada J, et al. Risk reduction in cardiovascular deaths or hospitalizations in subgroups of CRT patients optimized using the SonR contractility sensor: rESPOND-CRT subgroups analyses. *European journal of heart failure*. Conference: heart failure 2017 and the 4th world congress on acute heart failure. France. 2017;19:278. doi: 10.1002/ejhf.833. PMID: CN-01376781. - **Not full report**
1182. Padeletti L, Modesti PA, Cartei S, et al. Metabolomic does not predict response to cardiac resynchronization therapy in patients with heart failure. *J Cardiovasc Med (Hagerstown)*. 2014 Apr;15(4):295-300. doi: 10.2459/jcm.0000000000000028. PMID: 24699011. - **Not relevant to Key Questions**
1183. Padeletti L, Modesti PA, Cartei S, et al. Metabolomic does not predict response to cardiac resynchronization therapy in patients with heart failure. *J Cardiovasc Med (Hagerstown)*. 2014 Apr;15(4):295-300. doi: 10.2459/jcm.0000000000000028. PMID: 24699011. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1184. Page E, Cazeau S, Ritter P, et al. Physiological approach to monitor patients in congestive heart failure: application of a new implantable device-based system to monitor daily life activity and ventilation. *Europace*. 2007 2007 Aug;9(8):687-93. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1185. Palmisano P, Accogli M, Pisano EC, et al. Reduced long-term overall mortality in heart failure patients with prolonged QRS treated with CRT combined with ICD vs. heart failure patients with narrow QRS treated with ICD only. *Europace*. 2016 Sep;18(9):1374-82. doi: 10.1093/europace/euv347. PMID: 26612878. - **Does not address outcome of interest**
1186. Pan G, Liu Z, He P, et al. Effect of periodic pacemaker

- optimization on left atrial reverse remodeling in long-term cardiac resynchronization therapy. *J Interv Card Electrophysiol*. 2014 Jan;39(1):87-93. doi: 10.1007/s10840-013-9833-3. PMID: 24150962. - **Does not address outcome of interest**
1187. Pan W, Su Y, Zhu W, et al. Notched QRS complex in lateral leads as a novel predictor of response to cardiac resynchronization therapy. *Ann Noninvasive Electrocardiol*. 2013 Mar;18(2):181-7. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1188. Panayiotou M, Housden RJ, Ishak A, et al. LV function validation of computer-assisted interventional system for cardiac resynchronisation therapy. *Int J Comput Assist Radiol Surg*. 2018 Jun;13(6):777-86. doi: 10.1007/s11548-018-1748-0. PMID: 29603064. - **Addresses only effectiveness, not an RCT**
1189. Paoletti Perini A, Sacchi S, Votta CD, et al. Left ventricular rotational dyssynchrony before cardiac resynchronization therapy: a step forward into ventricular mechanics. *J Cardiovasc Med (Hagerstown)*. 2016 Jul;17(7):469-77. doi: 10.2459/jcm.0000000000000391. PMID: 27116377. - **Does not address outcome of interest**
1190. Papiashvili G, Machitidze G, Linde C, et al. EUROPEAN CARDIAC RESYNCHRONIZATION THERAPY SURVEY II: COMPARISON OF RESULTS IN GEORGIA WITH OTHER COUNTRIES. *Georgian medical news*. 2019(286):50-4. - **Addresses effectiveness questions only and is not RCT**
1191. Pappone C, Calovic Z, Vicedomini G, et al. Improving cardiac resynchronization therapy response with multipoint left ventricular pacing: Twelve-month follow-up study. *Heart Rhythm*. 2015 Jun;12(6):1250-8. doi: 10.1016/j.hrthm.2015.02.008. PMID: 25678057. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1192. Pappone C, Calovic Z, Vicedomini G, et al. Multipoint left ventricular pacing in a single coronary sinus branch improves mid-term echocardiographic and clinical response to cardiac resynchronization therapy. *J Cardiovasc Electrophysiol*. 2015 Jan;26(1):58-63. doi: 10.1111/jce.12513. PMID: 25109276. - **Does not address outcome of interest**
1193. Pappone C, Calovic Z, Vicedomini G, et al. Multipoint left ventricular pacing improves acute hemodynamic response assessed with pressure-volume loops in cardiac resynchronization therapy patients. *Heart Rhythm*. 2014 Mar;11(3):394-401. doi: 10.1016/j.hrthm.2013.11.023. PMID: 24291411. - **Does not address outcome of interest**
1194. Park MY, Altman RK, Orencole M, et al. Characteristics of responders to cardiac resynchronization therapy: the impact of echocardiographic left

- ventricular volume. Clin Cardiol. 2012 Dec;35(12):777-80. - **Addresses only effectiveness, not an RCT**
1195. Parreira L, Ferreira Santos J, Madeira J, et al. Cardiac resynchronization therapy with sequential biventricular pacing: Impact of echocardiography guided VV delay optimization on acute results: Terapeutica de ressincronizacao cardiaca com pacing biventricular sequencial: Importancia da optimizacao do intervalo VV por ecocardiografia na resposta aguda a terapeutica. Rev. Port. Cardiol. 2005;24(11):1355-65 - **Not relevant to Key Questions**
1196. Pastore G, Morani G, Maines M, et al. Patients with right bundle branch block and concomitant delayed left ventricular activation respond to cardiac resynchronization therapy. Europace. 2017 Dec 25doi: 10.1093/europace/eux362. PMID: 29294014. - **Addresses only effectiveness, not an RCT**
1197. Pastore G, Morani G, Maines M, et al. Patients with right bundle branch block and concomitant delayed left ventricular activation respond to cardiac resynchronization therapy. Europace. 2018;20(11):E171-E8. doi: 10.1093/europace/eux362. - **Addresses effectiveness questions only and is not RCT**
1198. Pasupula DK, Rajaratnam A, Rattan R, et al. Trends in Hospital Admissions for and Readmissions After Cardiac Implantable Electronic Device Procedures in the United States: An Analysis From 2010 to 2014 Using the National Readmission Database. Mayo Clin Proc. 2019;94(4):588-98. doi: 10.1016/j.mayocp.2018.10.028. - **Does not address outcome of interest**
1199. Patel N, Viles-Gonzalez J, Agnihotri K, et al. Frequency of in-hospital adverse outcomes and cost utilization associated with cardiac resynchronization therapy defibrillator implantation in the United States. J Cardiovasc Electrophysiol. 2018 Jul 17doi: 10.1111/jce.13701. PMID: 30016005. - **Population inclusion criteria do not fall within the QRS≥120ms and LVEF ≤35% range**
1200. Peix A, Karthikeyan G, Massardo T, et al. Value of intraventricular dyssynchrony assessment by gated-SPECT myocardial perfusion imaging in the management of heart failure patients undergoing cardiac resynchronization therapy (VISION-CRT). Journal of Nuclear Cardiology. 2019((Peix A., peix@infomed.sld.cu) Nuclear Medicine Department, Institute of Cardiology, 17 No. 702, Vedado, CP 10 400, La Habana, Cuba)doi: 10.1007/s12350-018-01589-5. - **Addresses effectiveness questions only and is not RCT**
1201. Penicka M, Vanderheyden M, Geelen P, et al. Tissue Doppler predicts long-term clinical outcome after cardiac resynchronization therapy. Int J Cardiol. 2008 Feb 20;124(1):40-6.-**Other: gender not included; not rct**

1202. Penn J, Goldenberg I, McNitt S, et al. Changes in Drug Utilization and Outcome With Cardiac Resynchronization Therapy: A MADIT-CRT Substudy. *J Card Fail.* 2015 Jul;21(7):541-7. doi: 10.1016/j.cardfail.2015.03.006. PMID: 25800548. - **Does not address outcome of interest**
1203. Penn M, Miller LW, Anderson RD, et al. hSDF-1 over-expression to treat high risk ischemic heart failure patients-Phase II STOP-HF trial 1 year findings. *European heart journal.* 2015;36:22. doi: 10.1093/eurheartj/ehv398. PMID: CN-01129743. - **Not full report**
1204. Perego GB, Landolina M, Vergara G, et al. Implantable CRT device diagnostics identify patients with increased risk for heart failure hospitalization. *J Interv Card Electrophysiol.* 2008 2008 Dec;23(3):235-42. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1205. Peressutti D, Sinclair M, Bai W, et al. A framework for combining a motion atlas with non-motion information to learn clinically useful biomarkers: Application to cardiac resynchronisation therapy response prediction. *Med Image Anal.* 2017 Jan;35:669-84. doi: 10.1016/j.media.2016.10.002. PMID: 27770718. - **Does not address outcome of interest**
1206. Perge P, Boros AM, Szilagyi S, et al. Novel Biomarkers in Cardiac Resynchronization Therapy: Hepatocyte Growth Factor Is an Independent Predictor of Clinical Outcome. *Rev Esp Cardiol (Engl Ed).* 2018 Mar 23doi: 10.1016/j.rec.2017.12.015. PMID: 29580749. - **Does not address outcome of interest**
1207. Perkiomaki JS, Ruwald AC, Kutiyifa V, et al. Risk factors and the effect of cardiac resynchronization therapy on cardiac and non-cardiac mortality in MADIT-CRT. *Europace.* 2015 Dec;17(12):1816-22. doi: 10.1093/europace/euv201. PMID: 26071234. -**Other: same patients included in the main study with 1820 subjects.**
1208. Perrin MJ, Green MS, Redpath CJ, et al. Greater response to cardiac resynchronization therapy in patients with true complete left bundle branch block: a PREDICT substudy. *Europace.* 2012 2012 May;14(5):690-5 - **Not relevant to Key Questions**
1209. Perrin T, Mechulan A, Boveda S, et al. Does defibrillation testing influence outcomes after CRT-D implantation? A cause-of-death analysis from the DAI-PP study. *Int J Cardiol.* 2016 Oct 15;221:951-6. doi: 10.1016/j.ijcard.2016.06.189. PMID: 27441474. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1210. Perrotta L, Kandala J, L DIB, et al. Prognostic Impact of QRS Axis Deviation in Patients Treated With Cardiac Resynchronization Therapy. *J Cardiovasc Electrophysiol.* 2016 Mar;27(3):315-20. doi: 10.1111/jce.12887. PMID: 26640084. - **Addresses only effectiveness, not an RCT**

1211. Perrotta L, Ricciardi G, Pieragnoli P, et al. Application of the Seattle Heart Failure Model in patients on cardiac resynchronization therapy. *Pacing Clin Electrophysiol.* 2012 2012 Jan;35(1):88-94. - **Addresses only effectiveness, not an RCT**
1212. Perrotta L, Khaferi B, Chiostrri M, et al. Effects of smoking in patients treated with cardiac resynchronization therapy. *Intern Emerg Med.* 2014 2014 Apr;9(3):311-8 - **Not relevant to Key Questions**
1213. Peterson PN, Daugherty SL, Wang Y, et al. Gender differences in procedure-related adverse events in patients receiving implantable cardioverter-defibrillator therapy. *Circulation.* 2009 2009 Mar 3;119(8):1078-84 - **Not relevant to Key Questions**
1214. Peterson PN, Greiner MA, Qualls LG, et al. QRS duration, bundle-branch block morphology, and outcomes among older patients with heart failure receiving cardiac resynchronization therapy. *JAMA.* 2013 2013 Aug 14;310(6):617-26. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1215. Peterson PN, Varosy PD, Heidenreich PA, et al. Association of single- vs dual-chamber ICDs with mortality, readmissions, and complications among patients receiving an ICD for primary prevention. *JAMA.* 2013 2013 May 15;309(19):2025-34. - **Does not evaluate a CRT**
1216. Petrovic M, Milasinovic G, Vujisic Tesic B, et al. Gauging the response to cardiac resynchronization therapy: The important interplay between predictor variables and definition of a favorable outcome. *Echocardiography.* 2017 Mar;34(3):371-5. doi: 10.1111/echo.13453. PMID: 28075037. - **Does not address outcome of interest**
1217. Pfau G, Schilling T, Kozian A, et al. Outcome after implantation of cardiac resynchronization/defibrillation systems in patients with congestive heart failure and left bundle-branch block. *J Cardiothorac Vasc Anesth.* 2010 2010 Feb;24(1):30-6. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1218. Philippon F, Liu L, Fung JW, et al. Left ventricular three-dimensional quadripolar lead acute clinical study: the LILAC study. *Pacing Clin Electrophysiol.* 2015 Apr;38(4):438-47. doi: 10.1111/pace.12584. PMID: 25627985. - **Does not address outcome of interest**
1219. Phillips KP, Harberts DB, Johnston LP, et al. Left ventricular resynchronization predicted by individual performance of right and left univentricular pacing: A study on the impact of sequential biventricular pacing on ventricular dyssynchrony. *Heart Rhythm.* 2007 2007;4(2):147-53. - **Population inclusion criteria do**

- not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1220. Pieragnoli P, Perego GB, Ricciardi G, et al. Cardiac resynchronization therapy acutely improves ventricular-arterial coupling by reducing the arterial load: assessment by pressure-volume loops. *Pacing Clin Electrophysiol.* 2015 Apr;38(4):431-7. doi: 10.1111/pace.12585. PMID: 25628069. - **Addresses only effectiveness, not an RCT**
1221. Piotrowicz E, Zielinski T, Bodalski R, et al. New model of home telemonitored nordic walking training in heart failure patients also those with cardiovascular implantable electronic devices: safety, effectiveness, adherence-randomized control study. *European heart journal.* 2013;34:1083. PMID: CN-01023836. – **Not full report**
1222. Pires LA, Abraham WT, Young JB, et al. Clinical predictors and timing of New York Heart Association class improvement with cardiac resynchronization therapy in patients with advanced chronic heart failure: results from the Multicenter InSync Randomized Clinical Evaluation (MIRACLE) and Multicenter InSync ICD Randomized Clinical Evaluation (MIRACLE-ICD) trials. *Am Heart J.* 2006 2006 Apr;151(4):837-43. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1223. Pires LA, Ghio S, Chung ES, et al. Relationship between acute improvement in left ventricular function to 6-month outcomes after cardiac resynchronization therapy in patients with chronic heart failure. *Congest Heart Fail.* 2011 2011 Mar-Apr;17(2):65-70. - **Addresses only effectiveness, not an RCT**
1224. Pires LA, McNitt S, Solomon S, et al. Left ventricular pacing threshold and outcome in MADIT-CRT. *J Cardiovasc Electrophysiol.* 2014 Sep;25(9):1005-11. doi: 10.1111/jce.12448. PMID: 24786979. - **Does not address outcome of interest**
1225. Pires R, Elvas L, Monteiro P, et al. Biventricular pacing--early experience. *Rev Port Cardiol.* 2001 2001 Dec;20(12):1235-9. – **Not in English**
1226. Pitzalis MV, Iacoviello M, Romito R, et al. Ventricular asynchrony predicts a better outcome in patients with chronic heart failure receiving cardiac resynchronization therapy. *J Am Coll Cardiol.* 2005 2005 Jan 4;45(1):65-9.-**Other: No required number of predictors in multivariate analysis**
1227. Plank B, Kuttyifa V, Moss AJ, et al. Smoking is associated with an increased risk of first and recurrent ventricular tachyarrhythmias in ischemic and nonischemic patients with mild heart failure: A MADIT-CRT substudy. *Heart Rhythm.* 2014;11(5):822-7. doi: 10.1016/j.hrthm.2014.02.007 - **Not relevant to Key Questions**

1228. Plank B, Kutyla V, Moss AJ, et al. Smoking is associated with an increased risk of first and recurrent ventricular tachyarrhythmias in ischemic and nonischemic patients with mild heart failure: A MADIT-CRT substudy. *Heart Rhythm*. 2014;11(5):822-7. doi: 10.1016/j.hrthm.2014.02.007. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1229. Plesinger F, Jurak P, Halamek J, et al. Ventricular Electrical Delay Measured From Body Surface ECGs Is Associated With Cardiac Resynchronization Therapy Response in Left Bundle Branch Block Patients From the MADIT-CRT Trial (Multicenter Automatic Defibrillator Implantation-Cardiac Resynchronization Therapy). *Circ Arrhythm Electrophysiol*. 2018 May;11(5):e005719. doi: 10.1161/circep.117.005719. PMID: 29700054. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1230. Płńska-Gościński E, Kasprzak JD, Kukulski T, et al. Role of low-dose dobutamine echocardiography in predicting response to biventricular pacing: Results from the multicenter Viability in Cardiac Resynchronisation Therapy (ViaCRT) study. *Pol Arch Med Wewn*. 2016;126(12):989-94. doi: 10.20452/pamw.3715. - **Does not address outcome of interest**
1231. Plonska-Gosciński E, Kasprzak JD, Kukulski T, et al. Role of lowdose dobutamine echocardiography in predicting response to biventricular pacing. Results from the multicenter Viability in Cardiac Resynchronisation Therapy (ViaCRT) study. *Pol Arch Med Wewn*. 2016 Dec 12;126(12):989-94. doi: 10.20452/pamw.3715. PMID: 27958262. - **Does not address outcome of interest**
1232. Ploux S, Eschalier R, Whinnett ZI, et al. Electrical dyssynchrony induced by biventricular pacing: implications for patient selection and therapy improvement. *Heart Rhythm*. 2015 Apr;12(4):782-91. doi: 10.1016/j.hrthm.2014.12.031. PMID: 25546811. - **Does not address outcome of interest**
1233. Ploux S, Whinnett Z, Lumens J, et al. Acute hemodynamic response to biventricular pacing in heart failure patients with narrow, moderately, and severely prolonged QRS duration. *Heart Rhythm*. 2012 2012 Aug;9(8):1247-50. - **Addresses only effectiveness, not an RCT**
1234. Ploux S, Whinnett Z, Lumens J, et al. Acute hemodynamic response to biventricular pacing in heart failure patients with narrow, moderately, and severely prolonged QRS duration. *Heart Rhythm*. 2012 2012 Aug;9(8):1247-50. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1235. Podolecki T, Pudlo R, Mazurek M, et al. The Incidence, Clinical Significance, and Treatment Effects of Depression in Cardiac Resynchronization Therapy Recipients. *Cardiology*.

- 2017;138(2):115-21. doi: 10.1159/000475522. PMID: 28641292. - **Does not address outcome of interest**
1236. Polewczyk A, Jachec W, Polewczyk AM, et al. Infectious complications in patients with cardiac implantable electronic devices: risk factors, prevention, and prognosis. *Pol Arch Intern Med.* 2017 Sep 29;127(9):597-607. doi: 10.20452/pamw.4065. PMID: 28724879. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1237. Poller WC, Dreger H, Schwerg M, et al. Not left ventricular lead position, but the extent of immediate asynchrony reduction predicts long-term response to cardiac resynchronization therapy. *Clin Res Cardiol.* 2014 2014 Jan 28 - **Not relevant to Key Questions**
1238. Poposka L, Boskov V, Risteski D, et al. Electrocardiographic Parameters as Predictors of Response to Cardiac Resynchronization Therapy. *Open Access Maced J Med Sci.* 2018 Feb 15;6(2):297-302. doi: 10.3889/oamjms.2018.092. PMID: 29531592. - **Does not address outcome of interest**
1239. Porciani MC, Macioce R, Demarchi G, et al. Effects of cardiac resynchronization therapy on the mechanisms underlying functional mitral regurgitation in congestive heart failure. *Eur J Echocardiogr.* 2006 2006 Jan;7(1):31-9. - **Addresses only effectiveness, not an RCT**
1240. Porciani MC, Sabini A, Colella A, et al. Interatrial septum pacing avoids the adverse effect of interatrial delay in biventricular pacing: an echo-Doppler evaluation. *Europace.* 2002 2002 Jul;4(3):317-24 - **Not relevant to Key Questions**
1241. Porciani MC, Sabini A, Colella A, et al. Interatrial septum pacing avoids the adverse effect of interatrial delay in biventricular pacing: an echo-Doppler evaluation. *Europace.* 2002 2002 Jul;4(3):317-24. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1242. Pouleur AC, Knappe D, Shah AM, et al. Relationship between improvement in left ventricular dyssynchrony and contractile function and clinical outcome with cardiac resynchronization therapy: the MADIT-CRT trial. *Eur Heart J.* 2011 2011 Jul;32(14):1720-9 - **Not relevant to Key Questions**
1243. Poulidakis E, Aggeli C, Sideris S, et al. Echocardiography for prediction of 6-month and late response to cardiac resynchronization therapy: implementation of stress echocardiography and comparative assessment along with widely used dyssynchrony indices. *International Journal of Cardiovascular Imaging.* 2019;35(2):285-94. doi: 10.1007/s10554-018-01520-6. - **Addresses effectiveness questions only and is not RCT**
1244. Powell AC, Rogstad TL, Deshmukh UU, et al. An

- exploration of the association between ischemic etiology and the likelihood of heart failure hospitalization following cardiac resynchronization therapy. Clin Cardiol. 2017 Nov;40(11):1090-4. doi: 10.1002/clc.22779. PMID: 28846805. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1245. Praus R, Haman L, Tauchman M, et al. Cardiac resynchronization therapy in clinical responders: right ventricular echocardiographic changes at mid-term follow-up. Acta Cardiol. 2012 Jun;67(3):311-6. - **Addresses only effectiveness, not an RCT**
1246. Praus R, Haman L, Tauchman M, et al. Echocardiographic changes after cardiac resynchronisation therapy. Kardiol Pol. 2012;70(12):1250-7 - **Not relevant to Key Questions**
1247. Pres D, Niedziela J, Kurek A, et al. In-hospital and long-term prognosis in patients after the implantation of implantable cardioverter-defibrillators and cardiac resynchronization therapy: ten-year results of the SILCARD register. Pol Arch Intern Med. 2018 Sep 14;doi: 10.20452/pamw.4332. PMID: 30215623. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1248. Pres D, Niedziela J, Kurek A, et al. In-hospital and long-term prognosis in patients after implantation of implantable cardioverter-defibrillators and cardiac resynchronization therapy: 10-year results of the SILCARD registry. Pol Arch Intern Med. 2018 Oct 31;128(10):580-6. doi: 10.20452/pamw.4332. PMID: 30215623. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1249. Pres D, Niedziela J, Kurek A, et al. In-hospital and long-term prognosis in patients after implantation of implantable cardioverter-defibrillators and cardiac resynchronization therapy: 10-year results of the SILCARD registry. Pol Arch Intern Med. 2018;128(10):580-6. doi: 10.20452/pamw.4332. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1250. Pressler A, Danner M, Esefeld K, et al. Validity of cardiac implantable electronic devices in assessing daily physical activity. Int. J. Cardiol. 2013;168(2):1127-30 - **Not relevant to Key Questions**
1251. Prinzen FW, Auricchio A. Is echocardiographic assessment of dyssynchrony useful to select candidates for cardiac resynchronization therapy? Echocardiography is not useful before cardiac resynchronization therapy if QRS duration is available. Circ Cardiovasc Imaging. 2008 Jul;1(1):70-7; discussion 8. - **No original data**
1252. Prochnau D, Kuehnert H, Figulla HR, et al. QRS duration and QTc interval are predictors of risk for ventricular arrhythmias during cardiac resynchronization therapy.

- Acta Cardiol. 2011 2011
Aug;66(4):415-20 - **Not relevant to Key Questions**
1253. Prochnau D, Kuehnert H, Heinke M, et al. Left ventricular lead position and nonspecific conduction delay are predictors of mortality in patients during cardiac resynchronization therapy. Can J Cardiol. 2011 2011 May-Jun;27(3):363-8. - **Addresses only effectiveness, not an RCT**
1254. Providencia R, Barra S, Papageorgiou N, et al. Bifocal right ventricular pacing in patients with failed coronary-sinus lead implants: long-term results from multicentre registry. Europace. Conference: heart rhythm congress 2016. United kingdom. 2016;18:ii11. doi: 10.1093/europace/euw271. PMID: CN-01406723. – **Not full report**
1255. Providencia R, Barra S, Papageorgiou N, et al. Dual-site right ventricular pacing in patients undergoing cardiac resynchronization therapy: Results of a multicenter propensity-matched analysis. Pacing Clin Electrophysiol. 2017 Oct;40(10):1113-20. doi: 10.1111/pace.13145. PMID: 28734025. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1256. Providencia R, Boveda S, Lambiase P, et al. Prediction of Nonarrhythmic Mortality in Primary Prevention Implantable Cardioverter-Defibrillator Patients With Ischemic and Nonischemic Cardiomyopathy. JACC Clin Electrophysiol. 2015 Mar - Apr;1(1-2):29-37. doi: 10.1016/j.jacep.2015.01.004. PMID: 29759336. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1257. Providencia R, Marijon E, Barra S, et al. Usefulness of a clinical risk score to predict the response to cardiac resynchronization therapy. Int J Cardiol. 2018 Jun 1;260:82-7. doi: 10.1016/j.ijcard.2018.02.012. PMID: 29622458. - **Does not address outcome of interest**
1258. Providencia R, Marijon E, Lambiase PD, et al. Primary Prevention Implantable Cardioverter Defibrillator (ICD) Therapy in Women-Data From a Multicenter French Registry. J Am Heart Assoc. 2016 Feb 12;5(2)doi: 10.1161/jaha.115.002756. PMID: 26873687. - **Does not evaluate a CRT**
1259. Providencia R, Rogers D, Papageorgiou N, et al. Long-Term Results of Triventricular Versus Biventricular Pacing in Heart Failure: A Propensity-Matched Comparison. JACC Clin Electrophysiol. 2016 Dec;2(7):825-35. doi: 10.1016/j.jacep.2016.05.015. PMID: 29759767. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1260. Providencia R, Rogers D, Papageorgiou N, et al. Tri-ventricular pacing improves long-term survival and freedom from ventricular arrhythmias in advanced heart failure: results

- from a propensity-matched comparison. *European journal of heart failure*. 2016;18:311. doi: 10.1002/ejhf.539. PMID: CN-01160161. – **Not full report**
1261. Prutkin JM, Reynolds MR, Bao H, et al. Rates of and factors associated with infection in 200 909 medicare implantable cardioverter-defibrillator implants results from the national cardiovascular data registry. *Circulation*. 2014;130(13):1037-43. doi: 10.1161/circulationaha.114.009081. PMID: 25081281
1262. Ptaszynska-Kopczynska K, Szpakowicz A, Marcinkiewicz-Siemion M, et al. Interleukin-6 signaling in patients with chronic heart failure treated with cardiac resynchronization therapy. *Arch Med Sci*. 2017 Aug;13(5):1069-77. doi: 10.5114/aoms.2016.58635. PMID: 28883848. - **Does not address outcome of interest**
1263. Pu LJ, Wang Y, Zhao L, et al. Cardiac resynchronization therapy (CRT) with right ventricular sense triggered left ventricular pacing benefits for the hemodynamics compared with standard CRT for chronic congestive heart failure: A cross-over study. *Cardiol J*. 2015;22(1):80-6. doi: 10.5603/CJ.a2014.0058. PMID: 25179313. - **Does not address outcome of interest**
1264. Pu LJ, Wang Y, Zhao LL, et al. Left univentricular pacing for cardiac resynchronization therapy using rate-adaptive atrioventricular delay. *J Geriatr Cardiol*. 2017 Feb;14(2):118-26. doi: 10.11909/j.issn.1671-5411.2017.02.006. PMID: 28491086. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1265. Pugliese M, Minardi G, Vitali A, et al. Influence of myocardial viability on responsiveness to cardiac resynchronization in ischemic dilated cardiomyopathy: a prospective observational cohort study. *Anadolu Kardiyol Derg*. 2012 2012 Mar;12(2):132-41 - **Not relevant to Key Questions**
1266. Pugliese M, Minardi G, Vitali A, et al. Influence of myocardial viability on responsiveness to cardiac resynchronization in ischemic dilated cardiomyopathy: a prospective observational cohort study. *Anadolu Kardiyol Derg*. 2012 2012 Mar;12(2):132-41. - **Addresses only effectiveness, not an RCT**
1267. Pyatt JR, Somauroo JD, Jackson M, et al. Long-term survival after permanent pacemaker implantation: analysis of predictors for increased mortality. *Europace*. 2002 2002 Apr;4(2):113-9. - **Does not evaluate a CRT**
1268. Pyszno-Prokopowicz D, Baranowski R, Bodalski R, et al. R/S Ratio Variability in Lead V1 Observed between Selected Four 1-Minute ECG Fragments of 24-Hour ECG as a Predictor of Incomplete Resynchronization during Full 24-Hour ECG: Pilot Study. *Ann Noninvasive Electrocardiol*. 2016 Jul;21(4):397-403. doi: 10.1111/anec.12326. PMID:

26514634. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1269. Qi S, Wang D, Yu H, et al. A multi-center study on the long-term mortality and related risk factors in patients with chronic heart failure receiving resynchronization therapy. Chinese journal of cardiology. 2016;44(11):951-5. doi: 10.3760/cma.j.issn.0253-3758.2016.11.010. PMID: CN-01299417. – **Not in English**
1270. Qiao Q, Xu W, Li XH, et al. Cardiac resynchronization therapy guided by tissue Doppler. Biomedical Research (India). 2016;27(1):152-4. - **Does not address outcome of interest**
1271. Qin S, Shi H, Su Y, et al. Can the Prognosis of Cardiac Resynchronization Therapy Be Predicted by Gated SPECT? Clin Nucl Med. 2015 Oct;40(10):786-92. doi: 10.1097/rlu.0000000000000912. PMID: 26222532. - **Addresses only effectiveness, not an RCT**
1272. Qiu Q, Chen YX, Mai JT, et al. Effects of cardiac resynchronization therapy on left ventricular remodeling and dyssynchrony in patients with left ventricular noncompaction and heart failure. Int J Cardiovasc Imaging. 2015 Feb;31(2):329-37. doi: 10.1007/s10554-014-0568-8. PMID: 25392055. - **Does not address outcome of interest**
1273. Raab S, Oertel F, Weimann T, et al. Brain natriuretic peptide--a reliable parameter for the effectiveness of cardiac resynchronization therapy after coronary artery bypass grafting. Interact Cardiovasc Thorac Surg. 2006 2006 Aug;5(4):439-43 - **Not relevant to Key Questions**
1274. Rafique AM, Thomas Peter C, Naqvi TZ. A revised approach to patient selection for cardiac resynchronization treatment using multiple asynchrony parameters in Narrow- and Wide-QRS cardiomyopathy causes cardiac reverse remodelling: a single centre non-randomized prospective study. Europace. 2010 2010 Aug;12(8):1127-35. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1275. Rahbi H, El-Din M, Salloum M, et al. Complex cardiac pacing in the setting of a district general hospital: procedural success and complications. Heart Asia. 2014;6(1):94-9. doi: 10.1136/heartasia-2013-010421. PMID: 27326179. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1276. Ramachandran R, Chen X, Kramer CM, et al. Singular Value Decomposition Applied to Cardiac Strain from MR Imaging for Selection of Optimal Cardiac Resynchronization Therapy Candidates. Radiology. 2015 May;275(2):413-20. doi: 10.1148/radiol.14141578. PMID: 25581423. - **Does not address outcome of interest**
1277. Rao BH, Kalavakolanu S, Chandrasekar K, et al. Cardiac resynchronization therapy in

- hemodynamically unstable heart failure patients. Indian Heart J. 2007 2007 Mar-Apr;59(2):185-7. – **Single case study**
1278. Rao BH, Kalavakolanu S, Chandrasekar K, et al. Cardiac resynchronization therapy in hemodynamically unstable heart failure patients. Indian Heart J. 2007 2007 Mar-Apr;59(2):185-7. - **Addresses only effectiveness, not an RCT**
1279. Rapacciuolo A, Maffe S, Palmisano P, et al. Prognostic Role of Right Ventricular Function in Patients With Heart Failure Undergoing Cardiac Resynchronization Therapy. Clin Cardiol. 2016 Nov;39(11):640-5. doi: 10.1002/clc.22574. PMID: 27468173. - **Does not address outcome of interest**
1280. Reant P, Zaroui A, Donal E, et al. Identification and characterization of super-responders after cardiac resynchronization therapy. Am J Cardiol. 2010 2010 May 1;105(9):1327-35 - **Not relevant to Key Questions**
1281. Regoli F, Bongiorno MG, Rordorf R, et al. High recurrence of device-related adverse events following transvenous lead extraction procedure in patients with cardiac resynchronization devices. Eur J Heart Fail. 2016 Oct;18(10):1270-7. doi: 10.1002/ejhf.558. PMID: 27170594. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1282. Regoli F, Scopigni F, Leyva F, et al. Validation of Seattle Heart Failure Model for mortality risk prediction in patients treated with cardiac resynchronization therapy. Eur J Heart Fail. 2013;15(2):211-20. doi: 10.1093/eurjhf/hfs162. - **Does not address outcome of interest**
1283. Reitan C, Bakos Z, Platonov PG, et al. Patient-assessed short-term positive response to cardiac resynchronization therapy is an independent predictor of long-term mortality. Europace. 2014 Nov;16(11):1603-9. doi: 10.1093/europace/euu058. PMID: 24681763 - **Not relevant to Key Questions**
1284. Reitan C, Bakos Z, Platonov PG, et al. Patient-assessed short-term positive response to cardiac resynchronization therapy is an independent predictor of long-term mortality. Europace. 2014 Nov;16(11):1603-9. doi: 10.1093/europace/euu058. PMID: 24681763. - **Does not address outcome of interest**
1285. Reitan C, Bakos Z, Platonov PG, et al. Patient-assessed short-term positive response to cardiac resynchronization therapy is an independent predictor of long-term mortality. Europace. 2014 Nov;16(11):1603-9. doi: 10.1093/europace/euu058. PMID: 24681763. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1286. Reitan C, Chaudhry U, Atwater B, et al. Semi-automated QRS score as a predictor of survival in CRT treated patients with strict left bundle branch block. J Electrocardiol. 2018 Mar -

- Apr;51(2):282-7. doi: 10.1016/j.jelectrocard.2017.11.001. PMID: 29203081. - **Does not address outcome of interest**
1287. Reitan C, Chaudhry U, Bakos Z, et al. Long-Term Results of Cardiac Resynchronization Therapy: A Comparison between CRT-Pacemakers versus Primary Prophylactic CRT-Defibrillators. *Pacing Clin Electrophysiol*. 2015 Jun;38(6):758-67. doi: 10.1111/pace.12631. PMID: 25788040. - **Addresses only effectiveness, not an RCT**
1288. Reithmann C, Herkommer B, Huemmer A, et al. The risk of delayed atrioventricular and intraventricular conduction block following ablation of bundle branch reentry. *Clin Res Cardiol*. 2013 Feb;102(2):145-53. - **Does not evaluate a CRT**
1289. Res JC, Bokern MJ, de Cock CC, et al. The BRIGHT study: bifocal right ventricular resynchronization therapy: a randomized study. *Europace*. 2007 Oct;9(10):857-61 - **Not relevant to Key Questions**
1290. Reuter S, Garrigue S, Barold SS, et al. Comparison of characteristics in responders versus nonresponders with biventricular pacing for drug-resistant congestive heart failure. *Am J Cardiol*. 2002 Feb 1;89(3):346-50 - **Not relevant to Key Questions**
1291. Riahi S, Sogaard P, Reddy VY, et al. Wireless LV endocardial pacing for CRT, select-LV study: ischaemic patients. *Europace*. Conference: world congress in cardiac electrophysiology and cardiac techniques 2016. France. 2016;18:i179. doi: 10.1093/europace/euw158. PMID: CN-01406377. - **Not full report**
1292. Ricci R, Ansalone G, Toscano S, et al. Cardiac resynchronization: Materials, technique and results. The InSync Italian Registry. *Eur Heart J. Suppl*. 2000 2000;2(J):J6-J15. - **No original data**
1293. Ricci R, Pignalberi C, Ansalone G, et al. Early and late QRS morphology and width in biventricular pacing: relationship to lead site and electrical remodeling. *J Interv Card Electrophysiol*. 2002 2002 Jul;6(3):279-85 - **Not relevant to Key Questions**
1294. Ricci R, Pignalberi C, Ansalone G, et al. Early and late QRS morphology and width in biventricular pacing: relationship to lead site and electrical remodeling. *J Interv Card Electrophysiol*. 2002 2002 Jul;6(3):279-85. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1295. Ricciardi D, Giacomo DG, Antonio B, et al. Non invasive hemodynamic optimization of multisite left ventricular pacing: a multicenter pilot study. *Europace*. Conference: world congress in cardiac electrophysiology and cardiac techniques 2016. France. 2016;18:i115. doi: 10.1093/europace/euw158. PMID: CN-01406355. - **Not full report**
1296. Richardson TD, Hale L, Arteaga C, et al. Prospective Randomized

- Evaluation of Implantable Cardioverter-Defibrillator Programming in Patients With a Left Ventricular Assist Device. *J Am Heart Assoc.* 2018 Feb 23;7(5)doi: 10.1161/jaha.117.007748. PMID: 29475875. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1297. Rickard J, Baranowski B, Cheng A, et al. Comparative Efficacy of Cardiac Resynchronization Therapy in Africans Americans Compared With European Americans. *Am J Cardiol.* 2015 Oct 1;116(7):1101-5. doi: 10.1016/j.amjcard.2015.07.016. PMID: 26359119. - **Addresses only effectiveness, not an RCT**
1298. Rickard J, Baranowski B, Grimm RA, et al. Left Ventricular Size does not Modify the Effect of QRS Duration in Predicting Response to Cardiac Resynchronization Therapy. *Pacing Clin Electrophysiol.* 2017 May;40(5):482-7. doi: 10.1111/pace.13043. PMID: 28164328. - **Does not address outcome of interest**
1299. Rickard J, Bassiouny M, Cronin EM, et al. Predictors of response to cardiac resynchronization therapy in patients with a non-left bundle branch block morphology. *Am J Cardiol.* 2011 2011 Dec 1;108(11):1576-80 - **Not relevant to Key Questions**
1300. Rickard J, Bassiouny M, Cronin EM, et al. Predictors of response to cardiac resynchronization therapy in patients with a non-left bundle branch block morphology. *Am J Cardiol.* 2011 2011 Dec 1;108(11):1576-80. - **Addresses only effectiveness, not an RCT**
1301. Rickard J, Bassiouny M, Tedford RJ, et al. Long-term outcomes in patients with ambulatory new york heart association class III and IV heart failure undergoing cardiac resynchronization therapy. *Am J Cardiol.* 2015 Jan 1;115(1):82-5. doi: 10.1016/j.amjcard.2014.09.052. PMID: 25491007. - **Does not address outcome of interest**
1302. Rickard J, Brennan DM, Martin DO, et al. The impact of left ventricular size on response to cardiac resynchronization therapy. *Am Heart J.* 2011 2011 Oct;162(4):646-53. - **Addresses only effectiveness, not an RCT**
1303. Rickard J, Brennan DM, Martin DO, et al. The impact of left ventricular size on response to cardiac resynchronization therapy. *Am Heart J.* 2011 2011 Oct;162(4):646-53. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1304. Rickard J, Cheng A, Spragg D, et al. A clinical prediction rule to identify patients at heightened risk for early demise following cardiac resynchronization therapy. *J Cardiovasc Electrophysiol.* 2014;25(3):278-82. doi: 10.1111/jce.12344. - **Does not address outcome of interest**
1305. Rickard J, Cheng A, Spragg D, et al. Durability of the survival effect of cardiac resynchronization therapy by level of left ventricular functional

- improvement: Fate of "nonresponders". Heart Rhythm. 2014;11(3):412-6. doi: 10.1016/j.hrthm.2013.11.025. - **Does not address outcome of interest**
1306. Rickard J, Cheng A, Spragg D, et al. Survival in Octogenarians Undergoing Cardiac Resynchronization Therapy Compared to the General Population. Pacing Clin Electrophysiol. 2014 2014 Jan 28 - **Not relevant to Key Questions**
1307. Rickard J, Cheng A, Spragg D, et al. Survival in Octogenarians Undergoing Cardiac Resynchronization Therapy Compared to the General Population. Pacing Clin Electrophysiol. 2014 2014 Jan 28. - **Addresses only effectiveness, not an RCT**
1308. Rickard J, Cheng A, Spragg D, et al. Survival in Octogenarians Undergoing Cardiac Resynchronization Therapy Compared to the General Population. Pacing Clin Electrophysiol. 2014 2014 Jan 28. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1309. Rickard J, Cronin E, Spragg D, et al. Characterization of response to cardiac resynchronization therapy in patients with a narrow QRS complex. Journal of the american college of cardiology. 2013;61(10 SUPPL. 1):E357. doi: 10.1016/s0735-1097%2813%2960357-5. PMID: CN-01008087. - **Not full report**
1310. Rickard J, Johnston DR, Price J, et al. Reverse ventricular remodeling and long-term survival in patients undergoing cardiac resynchronization with surgically versus percutaneously placed left ventricular pacing leads. Heart Rhythm. 2015 Mar;12(3):517-23. doi: 10.1016/j.hrthm.2014.11.013. PMID: 25460866. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1311. Rickard J, Kumbhani DJ, Gorodeski EZ, et al. Cardiac resynchronization therapy in non-left bundle branch block morphologies. Pacing Clin Electrophysiol. 2010 2010 May;33(5):590-5. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1312. Rickard J, Kumbhani DJ, Popovic Z, et al. Characterization of super-response to cardiac resynchronization therapy. Heart Rhythm. 2010 2010 Jul;7(7):885-9. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1313. Rickard J, Popovic Z, Verhaert D, et al. The QRS narrowing index predicts reverse left ventricular remodeling following cardiac resynchronization therapy. Pacing Clin Electrophysiol. 2011 2011 May;34(5):604-11 - **Not relevant to Key Questions**
1314. Rickard J, Popovic Z, Verhaert D, et al. The QRS narrowing index predicts reverse left ventricular remodeling following cardiac

- resynchronization therapy. Pacing Clin Electrophysiol. 2011 2011 May;34(5):604-11. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1315. Rickard J, Tarakji K, Cheng A, et al. Survival of patients with biventricular devices after device infection, extraction, and reimplantation. JACC Heart Fail. 2013 2013 Dec;1(6):508-13. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1316. Rickard J, Zardkoohi O, Popovic Z, et al. QRS fragmentation is not associated with poor response to cardiac resynchronization therapy. Ann Noninvasive Electrocardiol. 2011 2011 Apr;16(2):165-71 - **Not relevant to Key Questions**
1317. Rickard J, Zardkoohi O, Popovic Z, et al. QRS fragmentation is not associated with poor response to cardiac resynchronization therapy. Ann Noninvasive Electrocardiol. 2011 2011 Apr;16(2):165-71. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1318. Riedlbauchova L, Brunken R, Jaber WA, et al. The impact of myocardial viability on the clinical outcome of cardiac resynchronization therapy. J Cardiovasc Electrophysiol. 2009 2009 Jan;20(1):50-7.-**Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
1319. Riedlbauchova L, Fridl P, Kautzner J, et al. Performance of left ventricular versus biventricular pacing in chronic heart failure assessed by stress echocardiography. Pacing Clin Electrophysiol. 2004 2004 May;27(5):626-31 - **Not relevant to Key Questions**
1320. Rijal S, Wolfe J, Rattan R, et al. Lead related complications in quadripolar versus bipolar left ventricular leads. Indian Pacing Electrophysiol J. 2017;17(1):3-7. doi: 10.1016/j.ipej.2016.10.008. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1321. Rinaldi CA, Kranig W, Leclercq C, et al. Acute effects of multisite left ventricular pacing on mechanical dyssynchrony in patients receiving cardiac resynchronization therapy. J. Card. Fail. 2013 2013;19(11):731-8 - **Not relevant to Key Questions**
1322. Rinkuniene D, Bucyte S, Ceseviciute K, et al. Predictors of positive response to cardiac resynchronization therapy. BMC Cardiovasc Disord. 2014 Apr 29;14:55. doi: 10.1186/1471-2261-14-55. PMID: 24779476. - **Does not address outcome of interest**
1323. Rio P, Oliveira MM, Cunha PS, et al. What happens to non-responders in cardiac resynchronization therapy? Rev Port Cardiol. 2017 Dec;36(12):885-92. doi: 10.1016/j.repc.2017.02.017. PMID: 29225103. - **Does not address outcome of interest**

1324. Risum N, Sogaard P, Hansen TF, et al. Comparison of dyssynchrony parameters for VV-optimization in CRT patients. *Pacing Clin Electrophysiol.* 2013 Nov;36(11):1382-90. doi: 10.1111/pace.12203. PMID: 23827016. - **Addresses only effectiveness, not an RCT**
1325. Risum N, Tayal B, Hansen TF, et al. Identification of Typical Left Bundle Branch Block Contraction by Strain Echocardiography Is Additive to Electrocardiography in Prediction of Long-Term Outcome After Cardiac Resynchronization Therapy. *J Am Coll Cardiol.* 2015 Aug 11;66(6):631-41. doi: 10.1016/j.jacc.2015.06.020. PMID: 26248989. - **Addresses only effectiveness, not an RCT**
1326. Ritter O, Koller ML, Fey B, et al. Progression of heart failure in right univentricular pacing compared to biventricular pacing. *Int J Cardiol.* 2006 2006 Jun 28;110(3):359-65. - **Addresses only effectiveness, not an RCT**
1327. Ritter O, Koller ML, Fey B, et al. Progression of heart failure in right univentricular pacing compared to biventricular pacing. *Int J Cardiol.* 2006 2006 Jun 28;110(3):359-65. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1328. Rocha EA, Pereira FT, Abreu JS, et al. Development and Validation of Predictive Models of Cardiac Mortality and Transplantation in Resynchronization Therapy. *Arq Bras Cardiol.* 2015 Oct;105(4):399-409. doi: 10.5935/abc.20150093. PMID: 26559987. - **Addresses only effectiveness, not an RCT**
1329. Rocha EA, Pereira FT, Abreu JS, et al. Echocardiographic Predictors of Worse Outcome After Cardiac Resynchronization Therapy. *Arq Bras Cardiol.* 2015 Dec;105(6):552-9. doi: 10.5935/abc.20150108. PMID: 26351981. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1330. Rodrigues I, Abreu A, Oliveira M, et al. Impact on long-term cardiovascular outcomes of different cardiac resynchronization therapy response criteria. *Revista Portuguesa de Cardiologia.* 2018;37(12):961-9. doi: 10.1016/j.repc.2018.02.010. - **Does not address outcome of interest**
1331. Rodrigues I, Abreu A, Oliveira M, et al. The impact of different CRT response criteria in outcomes. *Europace.* Conference: world congress in cardiac electrophysiology and cardiac techniques 2016. France. 2016;18:i49. doi: 10.1093/europace/euw158. PMID: CN-01406339. - **Not full report**
1332. Rodriguez DJ, Afzal A, Evonich R, et al. The prevalence of methicillin resistant organisms among pacemaker and defibrillator implant recipients. *Am J Cardiovasc Dis.* 2012 2012;2(2):116-22 - **Not relevant to Key Questions**

1333. Rodriguez Y, Garisto J, Carrillo RG. Management of cardiac device-related infections: A review of protocol-driven care. *Int. J. Cardiol.* 2013;166(1):55-60. – **No original data**
1334. Rodriguez Y, Garisto J, Carrillo RG. Management of cardiac device-related infections: A review of protocol-driven care. *Int. J. Cardiol.* 2013;166(1):55-60 - **Not relevant to Key Questions**
1335. Roger S, Schneider R, Rudic B, et al. Cardiac contractility modulation: first experience in heart failure patients with reduced ejection fraction and permanent atrial fibrillation. *Europace.* 2014 Aug;16(8):1205-9. doi: 10.1093/europace/euu050. PMID: 24706089. - **Does not evaluate a CRT**
1336. Roger S, Schneider R, Rudic B, et al. Cardiac contractility modulation: first experience in heart failure patients with reduced ejection fraction and permanent atrial fibrillation. *Europace.* 2014 Aug;16(8):1205-9. doi: 10.1093/europace/euu050. PMID: 24706089. - **Addresses only effectiveness, not an RCT**
1337. Rogers DP, Marazia S, Chow AW, et al. Effect of biventricular pacing on symptoms and cardiac remodelling in patients with end-stage hypertrophic cardiomyopathy. *Eur J Heart Fail.* 2008 May;10(5):507-13.- **Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
1338. Romanov A, Goscinska-Bis K, Bis J, et al. Cardiac resynchronization therapy combined with coronary artery bypass grafting in ischemic heart failure patients: long-term results of the rescue study. *Europace.* Conference: world congress in cardiac electrophysiology and cardiac techniques 2016. France. 2016;18:i165. doi: 10.1093/europace/euw158. PMID: CN-01406385. – **Not full report**
1339. Romanov A, Goscinska-Bis K, Bis J, et al. Cardiac resynchronization therapy combined with coronary artery bypass grafting in ischaemic heart failure patients: long-term results of the RESCUE study. *Eur J Cardiothorac Surg.* 2016 Jul;50(1):36-41. doi: 10.1093/ejcts/ezv448. PMID: 26719401. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1340. Romanov A, Pokushalov E, Artyomenko S, et al. Long-term results after cardiac resynchronization therapy with or without surgical revascularization in patients with ischemic heart failure and left. *Eur Heart J.* 2013;34:945. PMID: CN-00997132. – **Not full report**
1341. Romanov A, Pokushalov E, Prokhorova D, et al. Totally epicardial cardiac resynchronization therapy concomitantly with coronary artery bypass grafting in patients

- with ischemic heart failure: three-year results of rescue study. Journal of the American College of Cardiology. 2013;61(10 SUPPL. 1):E568. doi: 10.1016/s0735-1097%2813%2960568-9. PMID: CN-01027936. – **Not full report**
1342. Ronn F, Kesek M, Karp K, et al. Right ventricular lead positioning does not influence the benefits of cardiac resynchronization therapy in patients with heart failure and atrial fibrillation. Europace. 2011 Dec;13(12):1747-52 - **Not relevant to Key Questions**
1343. Roque C, Trevisi N, Silberbauer J, et al. Electrical storm induced by cardiac resynchronization therapy is determined by pacing on epicardial scar and can be successfully managed by catheter ablation. Circ Arrhythm Electrophysiol. 2014 Dec;7(6):1064-9. doi: 10.1161/circep.114.001796. PMID: 25221332. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1344. Rordorf R, Savastano S, Sanzo A, et al. Tumor necrosis factor- α predicts response to cardiac resynchronization therapy in patients with chronic heart failure. Circ J. 2014;78(9):2232-9. PMID: 24954238. - **Does not address outcome of interest**
1345. Rosman J, Dhillon S, Mayer A, et al. Non-ischemic cardiomyopathy patients derive superior mortality benefit from cardiac resynchronization therapy. Indian Pacing Electrophysiol J. 2007;7(4):215-7. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1346. Rossillo A, Verma A, Saad EB, et al. Impact of coronary sinus lead position on biventricular pacing: mortality and echocardiographic evaluation during long-term follow-up. J Cardiovasc Electrophysiol. 2004 Oct;15(10):1120-5 - **Not relevant to Key Questions**
1347. Roubicek T, Wichterle D, Kucera P, et al. Left Ventricular Lead Electrical Delay Is a Predictor of Mortality in Patients With Cardiac Resynchronization Therapy. Circ Arrhythm Electrophysiol. 2015 Oct;8(5):1113-21. doi: 10.1161/circep.115.003004. PMID: 26338831. - **Does not address outcome of interest**
1348. Ruan ZB, Chen GC, Ren Y, et al. Prediction efficiency of serum cystatin C for clinical outcome in patients with cardiac resynchronization therapy. Ir J Med Sci. 2018 Feb 24;doi: 10.1007/s11845-018-1771-8. PMID: 29478109. - **Does not address outcome of interest**
1349. Ruan ZB, Zhu L, Chen GC, et al. Predictive value of serum cystatin C on cardiac resynchronization therapy. Experimental and Clinical Cardiology. 2014;20(5):3434-46. - **Does not address outcome of interest**
1350. Rubaj A, Ruciński P, Oleszczak K, et al. Inflammatory activation following interruption of long-term cardiac resynchronization therapy. Heart Vessels. 2013;28(5):583-8. doi: 10.1007/s00380-012-0285-y.

- PMID: 23242167. - **Does not address outcome of interest**
1351. Ruschitzka F, Abraham WT, Singh JP, et al. Cardiac-resynchronization therapy in heart failure with a narrow QRS complex. *New England Journal of Medicine*. 2013;369(15):1395-405. doi: 10.1056/NEJMoa1306687. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1352. Ruschitzka F, Abraham WT, Singh JP, et al. Cardiac-resynchronization therapy in heart failure with a narrow QRS complex. *N Engl J Med*. 2013 Oct 10;369(15):1395-405. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1353. Russo AM, Wang Y, Al-Khatib SM, et al. Patient, physician, and procedural factors influencing the use of defibrillation testing during initial implantable cardioverter defibrillator insertion: Findings from the NCDR®. *PACE - Pacing and Clinical Electrophysiology*. 2013;36(12):1522-31. doi: 10.1111/pace.12248. PMID: 23981009. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1354. Ruwald AC, Aktas MK, Ruwald MH, et al. Postimplantation ventricular ectopic burden and clinical outcomes in cardiac resynchronization therapy-defibrillator patients: a MADIT-CRT substudy. *Ann Noninvasive Electrocardiol*. 2018 Mar;23(2):e12491. doi: 10.1111/anec.12491. PMID: 28940909. - **Does not address outcome of interest**
1355. Ruwald AC, Aktas MK, Ruwald MH, et al. Postimplantation ventricular ectopic burden and clinical outcomes in cardiac resynchronization therapy-defibrillator patients: a MADIT-CRT substudy. *Annals of Noninvasive Electrocardiology*. 2018;23(2)doi: 10.1111/anec.12491. - **Other: Not relevant to CRT**
1356. Ruwald AC, Kutiyifa V, Ruwald MH, et al. The association between biventricular pacing and cardiac resynchronization therapy-defibrillator efficacy when compared with implantable cardioverter defibrillator on outcomes and reverse remodelling. *Eur Heart J*. 2015 Feb 14;36(7):440-8. doi: 10.1093/eurheartj/ehu294. PMID: 25112662 - **Not relevant to Key Questions**
1357. Ruwald AC, Kutiyifa V, Ruwald MH, et al. The association between biventricular pacing and cardiac resynchronization therapy-defibrillator efficacy when compared with implantable cardioverter defibrillator on outcomes and reverse remodelling. *Eur Heart J*. 2015 Feb 14;36(7):440-8. doi: 10.1093/eurheartj/ehu294. PMID: 25112662. - **Other: same patients included in the main study with 1820 subjects.**
1358. Ruwald AC, Pietrasik G, Goldenberg I, et al. The effect of intermittent atrial tachyarrhythmia on heart failure or death in cardiac

- resynchronization therapy with defibrillator versus implantable cardioverter-defibrillator patients: a MADIT-CRT substudy (Multicenter Automatic Defibrillator Implantation Trial With Cardiac Resynchronization Therapy). *J Am Coll Cardiol*. 2014 Apr 1;63(12):1190-7. doi: 10.1016/j.jacc.2013.10.074. PMID: 24333490. **-Other: prior review**
1359. Ruwald AC, Pietrasik G, Goldenberg I, et al. The effect of intermittent atrial tachyarrhythmia on heart failure or death in cardiac resynchronization therapy with defibrillator versus implantable cardioverter-defibrillator patients: a MADIT-CRT substudy (Multicenter Automatic Defibrillator Implantation Trial With Cardiac Resynchronization Therapy). *J Am Coll Cardiol*. 2014 Apr 1;63(12):1190-7. doi: 10.1016/j.jacc.2013.10.074. PMID: 24333490. **- Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1360. Ruwald MH, Abu-Zeitone A, Jons C, et al. Impact of carvedilol and metoprolol on inappropriate implantable cardioverter-defibrillator therapy: the MADIT-CRT trial (Multicenter Automatic Defibrillator Implantation With Cardiac Resynchronization Therapy). *J Am Coll Cardiol*. 2013 Oct 8;62(15):1343-50. **-Other: Patients stratified by ectopic burden**
1361. Ruwald MH, Mittal S, Ruwald AC, et al. Association between frequency of atrial and ventricular ectopic beats and biventricular pacing percentage and outcomes in patients with cardiac resynchronization therapy. *J Am Coll Cardiol*. 2014 Sep 9;64(10):971-81. doi: 10.1016/j.jacc.2014.06.1177. PMID: 25190230. **-Other: Not relevant to key questions**
1362. Ruwald MH, Mittal S, Ruwald AC, et al. Association between frequency of atrial and ventricular ectopic beats and biventricular pacing percentage and outcomes in patients with cardiac resynchronization therapy. *J Am Coll Cardiol*. 2014 Sep 9;64(10):971-81. doi: 10.1016/j.jacc.2014.06.1177. PMID: 25190230. **-Other: prior review**
1363. Ruwald MH, Moss AJ, Zareba W, et al. Circadian distribution of ventricular tachyarrhythmias and association with mortality in the MADIT-CRT trial. *J Cardiovasc Electrophysiol*. 2015 Mar;26(3):291-9. doi: 10.1111/jce.12592. PMID: 25431345. **- Does not address outcome of interest**
1364. Ruwald MH, Ruwald AC, Jons C, et al. Effect of metoprolol versus carvedilol on outcomes in MADIT-CRT (multicenter automatic defibrillator implantation trial with cardiac resynchronization therapy). *J Am Coll Cardiol*. 2013 Apr 9;61(14):1518-26. **- Not relevant to Key Questions**
1365. Ruwald MH, Solomon SD, Foster E, et al. Left ventricular ejection fraction normalization in cardiac resynchronization therapy and risk

- of ventricular arrhythmias and clinical outcomes: results from the Multicenter Automatic Defibrillator Implantation Trial With Cardiac Resynchronization Therapy (MADIT-CRT) trial. *Circulation*. 2014 Dec 23;130(25):2278-86. doi: 10.1161/circulationaha.114.011283. PMID: 25301831. **-Other: prior review**
1366. Saba S, Marek J, Alam MB, et al. Influence of QRS duration on outcome of death or appropriate defibrillator therapy by strategy of left ventricular lead placement in cardiac resynchronization therapy recipients. *J Interv Card Electrophysiol*. 2014 Dec;41(3):211-5. doi: 10.1007/s10840-014-9953-4. PMID: 25391355. **- Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1367. Saba S, Marek J, Schwartzman D, et al. Echocardiography-guided left ventricular lead placement for cardiac resynchronization therapy results of the speckle tracking assisted resynchronization therapy for electrode region trial. *Circulation: Heart Failure*. 2013;6(3):427-34. doi: 10.1161/circheartfailure.112.000078. PMID: 23476053 **-Other: prior review**
1368. Saba S, McLaughlin T, He M, et al. Cardiac Resynchronization Therapy Using Pacemakers versus Defibrillators in Patients with Non-Ischemic Cardiomyopathy: The United States Experience from 2007 to 2014. *Heart Rhythm*. 2019((Saba S., sabas@upmc.edu; Mulukutla S.) Heart and Vascular Institute, Pittsburgh, PA, United States)doi: 10.1016/j.hrthm.2019.04.028. **- Addresses effectiveness questions only and is not RCT**
1369. Sacchi S, Perini AP, Attana P, et al. Assessment of Myocardial Contractility by SonR Sensor in Patients Undergoing Cardiac Resynchronization Therapy. *Pacing Clin Electrophysiol*. 2016 Mar;39(3):268-74. doi: 10.1111/pace.12795. PMID: 26644068. **- Does not address outcome of interest**
1370. Sacchi S, Pieragnoli P, Ricciardi G, et al. Impact of haemodynamic SonR sensor on monitoring of left ventricular function in patients undergoing cardiac resynchronization therapy. *Europace*. 2017 Oct 1;19(10):1695-9. doi: 10.1093/europace/euw318. PMID: 28011801. **- Does not evaluate a CRT**
1371. Sade LE, Atar I, Ozin B, et al. Determinants of New-Onset Atrial Fibrillation in Patients Receiving CRT: Mechanistic Insights From Speckle Tracking Imaging. *JACC Cardiovasc Imaging*. 2016 Feb;9(2):99-111. doi: 10.1016/j.jcmg.2015.05.011. PMID: 26684972. **- Addresses only effectiveness, not an RCT**
1372. Sade LE, Özin B, Atar I, et al. Right ventricular function is a determinant of long-term survival after cardiac resynchronization therapy. *Journal of the American Society of Echocardiography*. 2013;26(7):706-13. doi: 10.1016/j.echo.2013.03.013. -

- Addresses only effectiveness, not an RCT**
1373. Sade LE, Saba S, Marek JJ, et al. The association of left ventricular lead position related to regional scar by speckle-tracking echocardiography with clinical outcomes in patients receiving cardiac resynchronization therapy. *Journal of the American Society of Echocardiography*. 2014;27(6):648-56. doi: 10.1016/j.echo.2014.01.025. PMID: 24637058. - **Addresses only effectiveness, not an RCT**
1374. Sadeghian H, Lotfi-Tokaldany M, Montazeri M, et al. Early Improvement in Mitral Regurgitation after Cardiac Resynchronization Therapy in Cardiomyopathy Patients. *J Heart Valve Dis*. 2017 Sep;26(5):557-63. PMID: 29762924. - **Does not address outcome of interest**
1375. Sadiq Ali F, Enriquez A, Conde D, et al. Advanced Interatrial Block Predicts New Onset Atrial Fibrillation in Patients with Severe Heart Failure and Cardiac Resynchronization Therapy. *Ann Noninvasive Electrocardiol*. 2015 Nov;20(6):586-91. doi: 10.1111/anec.12258. PMID: 25639950. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1376. Sairaku A, Yoshida Y, Nakano Y, et al. Don't expect left ventricular reverse remodeling after cardiac resynchronization therapy in patients with systolic heart failure and atrioventricular block: A multicenter study. *Int J Cardiol*. 2016 Oct 15;221:597-600. doi: 10.1016/j.ijcard.2016.06.338. PMID: 27420585. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1377. Salden OAE, van den Broek HT, van Everdingen WM, et al. Multimodality imaging for real-time image-guided left ventricular lead placement during cardiac resynchronization therapy implantations. *International Journal of Cardiovascular Imaging*. 2019((Salden O.A.E., o.a.e.salden@umcutrecht.nl; van den Broek H.T.; van Everdingen W.M.; Doevendans P.A.; Cramer M.-J.; Tuinenburg A.E.; van Slochteren F.J.; Meine M.) Department of Cardiology, University Medical Center Utrecht, Heidelberglaan 100, P.O. Box 85500, Utrecht, Netherlands)doi: 10.1007/s10554-019-01574-0. - **Addresses effectiveness questions only and is not RCT**
1378. Salukhe TV, Francis DP, Clague JR, et al. Chronic heart failure patients with restrictive LV filling pattern have significantly less benefit from cardiac resynchronization therapy than patients with late LV filling pattern. *Int J Cardiol*. 2005 2005 Apr 8;100(1):5-12. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1379. Samesima N, Douglas R, Tobias N, et al. Twenty-millisecond interventricular difference as assessed by body surface potential mapping identifies patients with clinical improvement after

- implantation of cardiac resynchronization device. Anadolu Kardiyol Derg. 2007 2007 Jul;7 Suppl 1:213-5 - **Not relevant to Key Questions**
1380. Santini M, Gasparini M, Landolina M, et al. Device-detected atrial tachyarrhythmias predict adverse outcome in real-world patients with implantable biventricular defibrillators. J Am Coll Cardiol. 2011 2011 Jan 11;57(2):167-72 - **Not relevant to Key Questions**
1381. Santomauro M, Pace L, Duilio C, et al. Left ventricular pacing in patients with heart failure: evaluation study with Fourier analysis of radionuclide ventriculography. Ital Heart J. 2004 2004 Dec;5(12):906-11 - **Not relevant to Key Questions**
1382. Santos JF, Caetano F, Parreira L, et al. Effects of cardiac resynchronization therapy on right ventricular function--evaluation with tissue Doppler echocardiography. Rev Port Cardiol. 2003 2003 Nov;22(11):1347-55 - **Not relevant to Key Questions**
1383. Santos JF, Caetano F, Parreira L, et al. Tissue Doppler echocardiography for evaluation of patients with ventricular resynchronization therapy. Rev Port Cardiol. 2003 2003 Nov;22(11):1363-71 - **Not relevant to Key Questions**
1384. Santos KR, Adragao P, Cavaco D, et al. Diaphragmatic myopotential oversensing in pacemaker-dependent patients with CRT-D devices. Europace. 2008 2008 Dec;10(12):1381-6 - **Not relevant to Key Questions**
1385. Santos KR, Adragao P, Cavaco D, et al. Diaphragmatic myopotential oversensing in pacemaker-dependent patients with CRT-D devices. Europace. 2008 2008 Dec;10(12):1381-6. - **Addresses only effectiveness, not an RCT**
1386. Sapp JL, Parkash R, Gardner MJ, et al. Cardiac resynchronization therapy reduces the incidence of ventricular arrhythmias in primary but not secondary prophylactic ICD patients: a substudy of the raft trial. Canadian journal of cardiology. 2015;31(10 SUPPL. 1):S91. PMID: CN-01163064. - **Not full report**
1387. Sapp JL, Parkash R, Gardner MJ, et al. Cardiac resynchronization therapy reduces the incidence of ventricular arrhythmias in primary prophylactic ICD patients: insights from the resynchronization in ambulatory heart failure trial. Heart rhythm. 2015;12(5 SUPPL. 1):S86. PMID: CN-01089012. - **Not full report**
1388. Sara Guerreiro S, Castro M, Carmo J, et al. Cardiac resynchronization therapy: what is the prognostic value of ventricular dyssynchrony by echocardiography? European journal of heart failure. Conference: heart failure 2017 and the 4th world congress on acute heart failure. France. 2017;19:580. doi: 10.1002/ejhf.833. PMID: CN-01376787. - **Not full report**

1389. Sardu C, Marfella R, Santulli G. Impact of Diabetes Mellitus on the Clinical Response to Cardiac Resynchronization Therapy in Elderly People. *J Cardiovasc Transl Res.* 2014 2014 Feb 6 - **Not relevant to Key Questions**
1390. Sardu C, Marfella R, Santulli G. Impact of Diabetes Mellitus on the Clinical Response to Cardiac Resynchronization Therapy in Elderly People. *J Cardiovasc Transl Res.* 2014 2014 Feb 6. - **Addresses only effectiveness, not an RCT**
1391. Sardu C, Paolisso P, Sacra C, et al. Cardiac resynchronization therapy with a defibrillator (CRTd) in failing heart patients with type 2 diabetes mellitus and treated by glucagon-like peptide 1 receptor agonists (GLP-1 RA) therapy vs. conventional hypoglycemic drugs: Arrhythmic burden, hospitalizations for heart failure, and CRTd responders rate. *Cardiovasc Diabetol.* 2018;17(1)doi: 10.1186/s12933-018-0778-9. - **Other: No comparison of interest**
1392. Sardu C, Paolisso P, Sacra C, et al. Cardiac resynchronization therapy with a defibrillator (CRTd) in failing heart patients with type 2 diabetes mellitus and treated by glucagon-like peptide 1 receptor agonists (GLP-1 RA) therapy vs. conventional hypoglycemic drugs: Arrhythmic burden, hospitalizations for heart failure, and CRTd responders rate. *Cardiovasc Diabetol.* 2018;17(1)doi: 10.1186/s12933-018-0778-9. - **Other: No comparison of interest**
1393. Sartori C, Degiovanni A, Devecchi F, et al. Acute modifications of left ventricular torsional mechanics induced by cardiac resynchronization therapy affect short-term reverse remodeling. *Circulation Journal.* 2019;83(2):386-94. doi: 10.1253/circj.CJ-18-0858. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1394. Sassone B, Bertini M, Beltrami M, et al. Relation of QRS Duration to Response to Cardiac Resynchronization Therapy in Patients With Left Bundle Branch Block. *Am J Cardiol.* 2017 Jun 1;119(11):1803-8. doi: 10.1016/j.amjcard.2017.02.043. PMID: 28391991. - **Does not address outcome of interest**
1395. Sassone B, Capecci A, Boggian G, et al. Value of baseline left lateral wall postsystolic displacement assessed by M-mode to predict reverse remodeling by cardiac resynchronization therapy. *Am J Cardiol.* 2007 2007 Aug 1;100(3):470-5 - **Not relevant to Key Questions**
1396. Sassone B, Gabrieli L, Sacca S, et al. Value of right ventricular-left ventricular interlead electrical delay to predict reverse remodelling in cardiac resynchronization therapy: the INTER-V pilot study. *Europace.* 2010 2010 Jan;12(1):78-83 - **Not relevant to Key Questions**
1397. Sassone B, Gambetti S, Bertini M, et al. Relation of QRS duration to response to cardiac resynchronization therapy. *Am J Cardiol.* 2015 Jan 15;115(2):214-

9. doi:
10.1016/j.amjcard.2014.10.024.
PMID: 25465934. - **Does not address outcome of interest**
1398. Sawhney V, Domenichini G, Gamble J, et al. Thrombo-embolic events in left ventricular endocardial pacing: long-term outcomes from a multicentre UK registry. *Europace*. 2018 Jun 1doi: 10.1093/europace/euy107. PMID: 29868905. - **Does not address outcome of interest**
1399. Saxon LA, Bristow MR, Boehmer J, et al. Predictors of sudden cardiac death and appropriate shock in the Comparison of Medical Therapy, Pacing, and Defibrillation in Heart Failure (COMPANION) Trial. *Circulation*. 2006 2006 Dec 19;114(25):2766-72.-**Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
1400. Saxon LA, De Marco T, Schafer J, et al. Effects of long-term biventricular stimulation for resynchronization on echocardiographic measures of remodeling. *Circulation*. 2002 2002 Mar 19;105(11):1304-10 - **Not relevant to Key Questions**
1401. Saxon LA, De Marco T, Schafer J, et al. Effects of long-term biventricular stimulation for resynchronization on echocardiographic measures of remodeling. *Circulation*. 2002 2002 Mar 19;105(11):1304-10. - **Addresses only effectiveness, not an RCT**
1402. Saxon LA, Kerwin WF, Cahalan MK, et al. Acute effects of intraoperative multisite ventricular pacing on left ventricular function and activation/contraction sequence in patients with depressed ventricular function. *J Cardiovasc Electrophysiol*. 1998 1998 Jan;9(1):13-21. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1403. Saxon LA, Olshansky B, Volosin K, et al. Influence of left ventricular lead location on outcomes in the COMPANION study. *J Cardiovasc Electrophysiol*. 2009 2009 Jul;20(7):764-8 - **Not relevant to Key Questions**
1404. Saxon LA. Does cardiac resynchronization therapy reduce the incidence of atrial fibrillation, and does atrial fibrillation compromise the cardiac resynchronization therapy effect? *Heart Rhythm*. 2007 2007;4(3 SUPPL.):S31-S3. – **No original data**
1405. Sbragia P, Nait-Saidi L, Alexandre Trigano J, et al. Intra-atrial thrombosis and pulmonary embolism complicating pacemaker leads for cardiac resynchronization therapy. *J. Intervent. Card. Electrophysiol*. 2003 2003;9(1):25-7. – **Single case study**
1406. Schaer B, Frey S, Sticherling C, et al. Persistent improvement of ejection fraction in patients with a

- cardiac resynchronisation therapy defibrillator correlates with fewer appropriate ICD interventions and lower mortality. *Swiss Med Wkly.* 2016;146:w14300. doi: 10.4414/smw.2016.14300. PMID: 27045533. - **Does not address outcome of interest**
1407. Schaer B, Theuns DA, Sticherling C, et al. Effect of implantable cardioverter-defibrillator on left ventricular ejection fraction in patients with idiopathic dilated cardiomyopathy. *Am J Cardiol.* 2010 2010 Dec 1;106(11):1640-5 - **Not relevant to Key Questions**
1408. Schaer BA, Hitz L, Sticherling C, et al. Changes in renal function over time in patients with cardiac resynchronisation therapy. *Swiss Med Wkly.* 2013 2013;143:w13863 - **Not relevant to Key Questions**
1409. Schaer BA, Hitz L, Sticherling C, et al. Changes in renal function over time in patients with cardiac resynchronisation therapy. *Swiss Med Wkly.* 2013;143doi: 10.4414/smw.2013.13863. PMID: 24163096
1410. Schaer BA, Hitz L, Sticherling C, et al. Changes in renal function over time in patients with cardiac resynchronisation therapy. *Swiss Med Wkly.* 2013 2013;143:w13863. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1411. Schaer BA, Osswald S, Di Valentino M, et al. Close connection between improvement in left ventricular function by cardiac resynchronization therapy and the incidence of arrhythmias in cardiac resynchronization therapy-defibrillator patients. *Eur J Heart Fail.* 2010 2010 Dec;12(12):1325-32. - **Addresses only effectiveness, not an RCT**
1412. Schau T, Koglek W, Brandl J, et al. Baseline vectorcardiography as a predictor of invasively determined acute hemodynamic response to cardiac resynchronization therapy. *Clin Res Cardiol.* 2013 2013 Feb;102(2):129-38 - **Not relevant to Key Questions**
1413. Scheffer MG, van Dessel PF, van Gelder BM, et al. Peak longitudinal strain delay is superior to TDI in the selection of patients for resynchronisation therapy. *Neth Heart J.* 2010 2010 Nov;18(12):574-82 - **Not relevant to Key Questions**
1414. Schiffer AA, Denollet J, Pedersen SS, et al. Health status in patients treated with cardiac resynchronization therapy: modulating effects of personality. *Pacing Clin Electrophysiol.* 2008 2008 Jan;31(1):28-37. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1415. Schleifer JW, Mookadam F, Kransdorf EP, et al. Effect of Continued Cardiac Resynchronization Therapy on Ventricular Arrhythmias After Left Ventricular Assist Device Implantation. *Am J Cardiol.* 2016 Aug 15;118(4):556-9. doi: 10.1016/j.amjcard.2016.05.050. PMID: 27328958. - **Does not address outcome of interest**

1416. Schlosshan D, Barker D, Pepper C, et al. CRT improves the exercise capacity and functional reserve of the failing heart through enhancing the cardiac flow- and pressure-generating capacity. *Eur J Heart Fail.* 2006 Aug;8(5):515-21. - **Addresses only effectiveness, not an RCT**
1417. Schmeisser A, Rauwolf T, Ghanem A, et al. Right heart function interacts with left ventricular remodeling after CRT: A pressure volume loop study. *Int J Cardiol.* 2018 Oct 1;268:156-61. doi: 10.1016/j.ijcard.2018.03.026. PMID: 29548538. - **Does not address outcome of interest**
1418. Schmeisser A, Rauwolf T, Ghanem A, et al. Right ventricular-pulmonary vascular interaction predicts left ventricular remodelling after CRT: a prospective pressure volume loop study. *European heart journal.* Conference: european society of cardiology, ESC congress 2017. Spain. 2017;38(Supplement 1):1167. doi: 10.1093/eurheartj/ehx502.P5476. PMID: CN-01468708. - **Not full report**
1419. Schmidt S, Hürlimann D, Starck CT, et al. Treatment with higher dosages of heart failure medication is associated with improved outcome following cardiac resynchronization therapy. *Eur Heart J.* 2014;35(16):1051-60. doi: 10.1093/eurheartj/ehf514. - **Does not address outcome of interest**
1420. Schmitz B, De Maria R, Gatsios D, et al. Identification of genetic markers for treatment success in heart failure patients: insight from cardiac resynchronization therapy. *Circ Cardiovasc Genet.* 2014 Dec;7(6):760-70. doi: 10.1161/circgenetics.113.000384. PMID: 25210049 - **Not relevant to Key Questions**
1421. Schmitz B, De Maria R, Gatsios D, et al. Identification of genetic markers for treatment success in heart failure patients: insight from cardiac resynchronization therapy. *Circ Cardiovasc Genet.* 2014 Dec;7(6):760-70. doi: 10.1161/circgenetics.113.000384. PMID: 25210049. - **Does not address outcome of interest**
1422. Schneider PM, Pellegrini CN, Wang Y, et al. Prevalence of guideline-directed medical therapy among patients receiving cardiac resynchronization therapy defibrillator implantation in the National Cardiovascular Data Registry during the years 2006 to 2008. *Am J Cardiol.* 2014 Jun 15;113(12):2052-6. doi: 10.1016/j.amjcard.2014.03.049. PMID: 24793671 - **Not relevant to Key Questions**
1423. Schneider PM, Pellegrini CN, Wang Y, et al. Prevalence of guideline-directed medical therapy among patients receiving cardiac resynchronization therapy defibrillator implantation in the National Cardiovascular Data Registry during the years 2006 to 2008. *Am J Cardiol.* 2014 Jun 15;113(12):2052-6. doi: 10.1016/j.amjcard.2014.03.049. PMID: 24793671. - **Population inclusion criteria do not fall**

- within the QRS \geq 120ms and LVEF \leq 35% range**
1424. Schuchert A, Muto C, Maounis T, et al. Relationship between pre-implant ejection fraction and outcome after cardiac resynchronization therapy in symptomatic patients. *Acta Cardiol.* 2014 Aug;69(4):424-32. doi: 10.2143/ac.69.4.3036659. PMID: 25181918 - **Not relevant to Key Questions**
1425. Schuchert A, Muto C, Maounis T, et al. Relationship between pre-implant ejection fraction and outcome after cardiac resynchronization therapy in symptomatic patients. *Acta Cardiol.* 2014 Aug;69(4):424-32. doi: 10.2143/ac.69.4.3036659. PMID: 25181918. - **Does not address outcome of interest**
1426. Schutte F, Ludorff G, Grove R, et al. Atrioventricular node ablation is not a prerequisite for cardiac resynchronization therapy in patients with chronic atrial fibrillation. *Cardiol J.* 2009 2009;16(3):246-9 - **Not relevant to Key Questions**
1427. Schwartzman D, Housel D, Bazaz R, et al. A pilot study to assess benefit of atrial rhythm control after cardiac resynchronization therapy and atrioventricular node ablation. *Pacing Clin Electrophysiol.* 2015 Feb;38(2):275-81. doi: 10.1111/pace.12535. PMID: 25431023. - **Does not address outcome of interest**
1428. Schwerg M, Dreger H, Poller WC, et al. Efficacy of optimal medical therapy and cardiac resynchronization therapy upgrade in patients with pacemaker-induced cardiomyopathy. *J Interv Card Electrophysiol.* 2015 Dec;44(3):289-96. doi: 10.1007/s10840-015-0059-4. PMID: 26403088. - **Addresses only effectiveness, not an RCT**
1429. Sciarra L, Golia P, Palama Z, et al. Patients with left bundle branch block and left axis deviation show a specific left ventricular asynchrony pattern: Implications for left ventricular lead placement during CRT implantation. *J Electrocardiol.* 2018 Mar - Apr;51(2):175-81. doi: 10.1016/j.jelectrocard.2017.10.006. PMID: 29174022. - **Addresses only effectiveness, not an RCT**
1430. Scuteri L, Rordorf R, Marsan NA, et al. Relevance of echocardiographic evaluation of right ventricular function in patients undergoing cardiac resynchronization therapy. *Pacing Clin Electrophysiol.* 2009 2009 Aug;32(8):1040-9 - **Not relevant to Key Questions**
1431. Sebag FA, Lellouche N, Chen Z, et al. Positive response to cardiac resynchronization therapy reduces arrhythmic events after elective generator change in patients with primary prevention CRT-D. *J Cardiovasc Electrophysiol.* 2014 Dec;25(12):1368-75. doi: 10.1111/jce.12496. PMID: 25066404. - **Does not address outcome of interest**
1432. Sedlacek K, Burianova L, Mlcochova H, et al. Isolated left ventricular pacing results in worse

- long-term clinical outcome when compared with biventricular pacing: a single-centre randomized study. *Europace*. 2010 Dec;12(12):1762-8. - **Addresses only effectiveness, not an RCT**
1433. Senfield J, Daubert C, Abraham WT, et al. The Impact of the PR Interval in Patients Receiving Cardiac Resynchronization Therapy: Results From the REVERSE Study. *JACC Clin Electrophysiol*. 2017 Aug;3(8):818-26. doi: 10.1016/j.jacep.2017.01.017. PMID: 29759777. - **Addresses only effectiveness, not an RCT**
1434. Seo Y, Ishizu T, Kawamura R, et al. Three-dimensional propagation imaging of left ventricular activation by speckle-tracking echocardiography to predict responses to cardiac resynchronization therapy. *J Am Soc Echocardiogr*. 2015 May;28(5):606-14. doi: 10.1016/j.echo.2015.02.003. PMID: 25797706. - **Does not address outcome of interest**
1435. Seo Y, Ishizu T, Machino-Ohtsuka T, et al. Incremental Value of Speckle Tracking Echocardiography to Predict Cardiac Resynchronization Therapy (CRT) Responders. *J Am Heart Assoc*. 2016 Oct 19;5(10)doi: 10.1161/jaha.116.003882. PMID: 27792652. - **Addresses only effectiveness, not an RCT**
1436. Separham A, Pourafkari L, Kazemi B, et al. Vitamin D deficiency and functional response to CRT in heart failure patients. *Herz*. 2017 Oct 9doi: 10.1007/s00059-017-4630-x. PMID: 28993847. - **Does not address outcome of interest**
1437. Separham A, Pourafkari L, Kazemi B, et al. Vitamin D deficiency and functional response to CRT in heart failure patients. *Herz*. 2019;44(2):147-54. doi: 10.1007/s00059-017-4630-x. - **Other: predictors**
1438. Sepsi M, Krivan L, Koza K M, et al. Optimization of cardiac resynchronization therapy in non-responders. *Cor Vasa*. 2013 2013;55(4):E293-E300. – **Not full report**
1439. Sepsi M, Krivan L, Koza K M, et al. Optimization of cardiac resynchronization therapy in non-responders. *Cor Vasa*. 2013 2013;55(4):E293-E300 - **Not relevant to Key Questions**
1440. Setoguchi S, Warner Stevenson L, Stewart GC, et al. Influence of healthy candidate bias in assessing clinical effectiveness for implantable cardioverter-defibrillators: cohort study of older patients with heart failure. *BMJ*. 2014 May 8;348:g2866. doi: 10.1136/bmj.g2866. PMID: 24812112 - **Not relevant to Key Questions**
1441. Shadman R, Poole JE, Dardas TF, et al. A novel method to predict the proportional risk of sudden cardiac death in heart failure: Derivation of the Seattle Proportional Risk Model. *Heart Rhythm*. 2015 Oct;12(10):2069-77. doi: 10.1016/j.hrthm.2015.06.039.

- PMID: 26142301. - **Does not address outcome of interest**
1442. Shah BN, Bethell HW, Senior R. Pacemaker-related reversible right heart failure. *Postgrad Med J*. 2013 2013 Aug;89(1054):486-7. – **Single case study**
1443. Shah RM, Molnar J, Ellenbogen K, et al. Cardiac resynchronization therapy defibrillator in patients with systolic heart failure and QRS duration < 130MS: a meta analysis of randomized clinical trials. *Heart rhythm*. 2014;11(5 SUPPL. 1):S314. doi: 10.1016/j.hrthm.2014.03.031. PMID: CN-01010772. - **Population inclusion criteria do not fall within the QRS≥120ms and LVEF ≤35% range**
1444. Shah RV, Altman RK, Park MY, et al. Usefulness of hemoglobin A(1c) to predict outcome after cardiac resynchronization therapy in patients with diabetes mellitus and heart failure. *Am J Cardiol*. 2012 2012 Sep 1;110(5):683-8. - **Addresses only effectiveness, not an RCT**
1445. Shahrzad S, Soleiman NK, Taban S, et al. The effect of left ventricular (LV) remodeling on ventricular arrhythmia in cardiac resynchronization therapy (CRT-D) patients (antiarrhythmic effect of CRT). *Pacing Clin Electrophysiol*. 2012 2012 May;35(5):592-7 - **Not relevant to Key Questions**
1446. Shalaby A, El-Saed A, Voigt A, et al. Elevated serum creatinine at baseline predicts poor outcome in patients receiving cardiac resynchronization therapy. *Pacing Clin Electrophysiol*. 2008 2008 May;31(5):575-9. - **Population inclusion criteria do not fall within the QRS≥120ms and LVEF ≤35% range**
1447. Shalaby A, Voigt A, El-Saed A, et al. Usefulness of pulmonary artery pressure by echocardiography to predict outcome in patients receiving cardiac resynchronization therapy heart failure. *Am J Cardiol*. 2008 2008 Jan 15;101(2):238-41. – **No original data**
1448. Shalaby AA, Abraham WT, Fonarow GC, et al. Association of BNP and Troponin Levels with Outcome among Cardiac Resynchronization Therapy Recipients. *Pacing Clin Electrophysiol*. 2015 May;38(5):581-90. doi: 10.1111/pace.12610. PMID: 25677851. - **Population inclusion criteria do not fall within the QRS≥120ms and LVEF ≤35% range**
1449. Shalaby AA, Brumberg GE, Pointer L, et al. Depression and Outcome among Veterans with Implantable Cardioverter Defibrillators with or without Cardiac Resynchronization Therapy Capability. *Pacing Clin Electrophysiol*. 2014 2014 Feb 12. - **Does not evaluate a CRT**
1450. Shalaby AA, Brumberg GE, Pointer L, et al. Depression and Outcome among Veterans with Implantable Cardioverter Defibrillators with or without Cardiac Resynchronization Therapy Capability. *Pacing Clin*

- Electrophysiol. 2014 2014 Feb 12
- **Not relevant to Key Questions**
1451. Shan P, Su L, Zhou X, et al. Beneficial effects of upgrading to His bundle pacing in chronically paced patients with left ventricular ejection fraction <50. Heart Rhythm. 2018 Mar;15(3):405-12. doi: 10.1016/j.hrthm.2017.10.031. PMID: 29081396. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1452. Shanks M, Antoni ML, Hoke U, et al. The effect of cardiac resynchronization therapy on left ventricular diastolic function assessed with speckle-tracking echocardiography. Eur J Heart Fail. 2011 2011 Oct;13(10):1133-9 - **Not relevant to Key Questions**
1453. Shantha G, Mentias A, Pothineni NVK, et al. Role of obstructive sleep apnea on the response to cardiac resynchronization therapy and all-cause mortality. Heart Rhythm. 2018 Sep;15(9):1283-8. doi: 10.1016/j.hrthm.2018.06.016. PMID: 30170662. - **Does not address outcome of interest**
1454. Sharma AK, Vegh E, Orencole M, et al. Association of hypothyroidism with adverse events in patients with heart failure receiving cardiac resynchronization therapy. Am J Cardiol. 2015 May 1;115(9):1249-53. doi: 10.1016/j.amjcard.2015.01.559. PMID: 25743211. - **Addresses only effectiveness, not an RCT**
1455. Sharma AK, Vegh EM, Kandala J, et al. Usefulness of hyponatremia as a predictor for adverse events in patients with heart failure receiving cardiac resynchronization therapy. Am J Cardiol. 2014 Jul 1;114(1):83-7. doi: 10.1016/j.amjcard.2014.04.009. PMID: 24852916 - **Not relevant to Key Questions**
1456. Sharma AK, Vegh EM, Kandala J, et al. Usefulness of hyponatremia as a predictor for adverse events in patients with heart failure receiving cardiac resynchronization therapy. Am J Cardiol. 2014 Jul 1;114(1):83-7. doi: 10.1016/j.amjcard.2014.04.009. PMID: 24852916. - **Addresses only effectiveness, not an RCT**
1457. Sharma PS, Dandamudi G, Herweg B, et al. Permanent His-bundle pacing as an alternative to biventricular pacing for cardiac resynchronization therapy: A multicenter experience. Heart Rhythm. 2018 Mar;15(3):413-20. doi: 10.1016/j.hrthm.2017.10.014. PMID: 29031929. - **Does not address outcome of interest**
1458. Shen X, Nair CK, Aronow WS, et al. Effect of carvedilol versus metoprolol CR/XL on mortality in patients with heart failure treated with cardiac resynchronization therapy: a COX multivariate regression analysis. Am J Ther. 2013 2013 May-Jun;20(3):247-53 - **Not relevant to Key Questions**
1459. Sherazi S, Goldenberg I, Moss AJ, et al. Comparison of low versus high (>40 mm Hg) pulse pressure to predict the benefit of

- cardiac resynchronization therapy for heart failure (from the Multicenter Automatic Defibrillator Implantation Trial-Cardiac Resynchronization Therapy Trial). *Am J Cardiol.* 2014 Oct 1;114(7):1053-8. doi: 10.1016/j.amjcard.2014.07.014. PMID: 25118116. **-Other: Patients stratified by pulse pressure**
1460. Sherazi S, Goldenberg I, Moss AJ, et al. Comparison of low versus high (>40 mm Hg) pulse pressure to predict the benefit of cardiac resynchronization therapy for heart failure (from the Multicenter Automatic Defibrillator Implantation Trial-Cardiac Resynchronization Therapy Trial). *Am J Cardiol.* 2014 Oct 1;114(7):1053-8. doi: 10.1016/j.amjcard.2014.07.014. PMID: 25118116. **-Other: prior review**
1461. Sherazi S, Kutyla V, McNitt S, et al. Prognostic Significance of Heart Rate Variability Among Patients Treated With Cardiac Resynchronization Therapy: MADIT-CRT (Multicenter Automatic Defibrillator Implantation Trial-Cardiac Resynchronization Therapy). *JACC Clin Electrophysiol.* 2015 Mar - Apr;1(1-2):74-80. doi: 10.1016/j.jacep.2015.03.004. PMID: 29759342. **- Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1462. Sherry D, Knight BP, Casey C, et al. A pilot study evaluating daily physical activity before and after cardiac resynchronization therapy. *Biol Res Nurs.* 2014 2014 Jan;16(1):31-7 - **Not relevant to Key Questions**
1463. Shi H, Shu X, Wang F, et al. Longitudinal two-dimensional strain rate imaging: a potential approach to predict the response to cardiac resynchronization therapy. *Int J Cardiovasc Imaging.* 2009 2009 Oct;25(7):677-87 - **Not relevant to Key Questions**
1464. Shigeru M, Fujiwara S, Takamine S, et al. Predicting the response to cardiac resynchronization therapy using ^{99m}Tc-tetrofosmin myocardial scintigraphy in patients with drug-refractory heart failure: additional value of the washout of ^{99m}Tc-tetrofosmin. *Nucl Med Commun.* 2014 Sep;35(9):939-46. doi: 10.1097/mnm.0000000000000150 . PMID: 24977350. **- Does not address outcome of interest**
1465. Shimano M, Tsuji Y, Yoshida Y, et al. Acute and chronic effects of cardiac resynchronization in patients developing heart failure with long-term pacemaker therapy for acquired complete atrioventricular block. *Europace.* 2007 2007 Oct;9(10):869-74. **- Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
1466. Shuaib W, Shahid H, Khan MS, et al. Outcome of prolonged QRS interval in dilated cardiomyopathy: role of implantable cardioverter-defibrillators on mortality. *Ther*

- Adv Cardiovasc Dis. 2015 Apr;9(2):36-9. doi: 10.1177/1753944714559935. PMID: 25411353. - **Does not address outcome of interest**
1467. Shun-Shin MJ, Miyazawa AA, Keene D, et al. How to deliver personalized Cardiac Resynchronization Therapy through the precise measurement of the acute hemodynamic response: insights from the iSpot trial. J Cardiovasc Electrophysiol. 2019 May 22doi: 10.1111/jce.14001. PMID: 31115945. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1468. Siciliano M, Migliore F, Badano L, et al. Cardiac resynchronization therapy by multipoint pacing improves response of left ventricular mechanics and fluid dynamics: a three-dimensional and particle image velocimetry echo study. Europace. 2017 Nov 1;19(11):1833-40. doi: 10.1093/europace/euw331. PMID: 28025231. - **Does not address outcome of interest**
1469. Sieniewicz BJ, Jackson T, Claridge S, et al. Variation in activation time during bipolar vs extended bipolar left ventricular pacing. J Cardiovasc Electrophysiol. 2018 Aug 14doi: 10.1111/jce.13714. PMID: 30106206. - **Addresses only effectiveness, not an RCT**
1470. Silva RT, Martinelli Filho M, Lima CE, et al. Functional behavior of patients with conventional pacemakers undergoing cardiac resynchronization. Arq Bras Cardiol. 2008 2008 Feb;90(2):138-43. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1471. Singal G, Upadhyay GA, Borgquist R, et al. Renal Response in Patients with Chronic Kidney Disease Predicts Outcome Following Cardiac Resynchronization Therapy. Pacing Clin Electrophysiol. 2015 Oct;38(10):1192-200. doi: 10.1111/pace.12685. PMID: 26179289. - **Does not address outcome of interest**
1472. Singh JP, Abraham WT, Chung ES, et al. Clinical response with adaptive CRT algorithm compared with CRT with echocardiography-optimized atrioventricular delay: a retrospective analysis of multicentre trials. Europace. 2013 Nov;15(11):1622-8. doi: 10.1093/europace/eut107. PMID: 24014804. - **Does not address outcome of interest**
1473. Singh JP, Baker J, Corbisiero R, et al. Impact of left ventricular lead location and QRS morphology on clinical outcomes with a quadripolar CRT-D system in the MultiPoint Pacing (MPP) IDE study. European heart journal. Conference: european society of cardiology, ESC congress 2017. Spain. 2017;38(Supplement 1):1171-2. doi: 10.1093/eurheartj/ehx502.P5490. PMID: CN-01468652. - **Not full report**

1474. Singh JP, Berger RD, Doshi RN, et al. Targeted left ventricular lead implantation in non-left bundle branch block patients: primary results of the enhance CRT pilot study. Heart rhythm. Conference: 39th annual scientific sessions of the heart rhythm society, heart rhythm 2018. United states. 2018;15(6):939. PMID: CN-01619843. – **Not full report**
1475. Singh JP, Delnoy PP, Brachmann J, et al. The sensor hemodynamic sensor guided resynchronization therapy is associated with reduction in heart failure hospitalization: results from the respond-CRT trial. Europace. Conference: world congress in cardiac electrophysiology and cardiac techniques 2016. France. 2016;18:i83. doi: 10.1093/europace/euw158. PMID: CN-01406413. – **Not full report**
1476. Singh JP, Fan D, Heist EK, et al. Left ventricular lead electrical delay predicts response to cardiac resynchronization therapy. Heart Rhythm. 2006 2006 Nov;3(11):1285-92.-**Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
1477. Sinner G, Omar HR, Lin YW, et al. Response to cardiac resynchronization therapy in non-ischemic cardiomyopathy is unrelated to medical therapy. Clin Cardiol. 2019;42(1):143-50. doi: 10.1002/clc.23123. - **Addresses effectiveness questions only and is not RCT**
1478. Sipal A, Bozyel S, Aktas M, et al. Surface electrogram-guided left ventricular lead placement improves response to cardiac resynchronization therapy. Anatol J Cardiol. 2018 Mar;19(3):184-91. doi: 10.14744/AnatolJCardiol.2018.09216. PMID: 29521312. - **Addresses only effectiveness, not an RCT**
1479. Sjoblom J, Borgquist R, Gadler F, et al. Clinical risk profile score predicts all cause mortality but not implantable cardioverter defibrillator intervention rate in a large unselected cohort of patients with congestive heart failure. Ann Noninvasive Electrocardiol. 2017 May;22(3)doi: 10.1111/anec.12414. PMID: 27800644.-**Other: not separate**
1480. Skaf S, Thibault B, Khairy P, et al. Impact of Left Ventricular vs Biventricular Pacing on Reverse Remodelling: Insights From the Evaluation of Resynchronization Therapy for Heart Failure (EARTH) Trial. Can J Cardiol. 2017 Oct;33(10):1274-82. doi: 10.1016/j.cjca.2017.07.478. PMID: 28941607. - **Other: Does not address outcome of interest**
1481. Skaf S, Thibault B, O'Meara E, et al. The impact of left ventricular versus simultaneous biventricular pacing on structural and biochemical reverse remodeling in patients with heart failure: insights from the evaluation of resynchronization therapy for heart failure (EARTH) trial. Circulation. 2015;132(no

- pagination) PMID: CN-01199193.
– **Not full report**
1482. Skali H, Dwyer EM, Goldstein R, et al. Prognosis and response to therapy of first inpatient and outpatient heart failure event in a heart failure clinical trial: MADIT-CRT. *Eur J Heart Fail.* 2014 Feb 27 - **Not relevant to Key Questions**
1483. Skali H, Dwyer EM, Goldstein R, et al. Prognosis and response to therapy of first inpatient and outpatient heart failure event in a heart failure clinical trial: MADIT-CRT. *Eur J Heart Fail.* 2014 Feb 27. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1484. Skali H, Gerwien R, Meyer TE, et al. Soluble ST2 and Risk of Arrhythmias, Heart Failure, or Death in Patients with Mildly Symptomatic Heart Failure: Results from MADIT-CRT. *J Cardiovasc Transl Res.* 2016 Dec;9(5-6):421-8. doi: 10.1007/s12265-016-9713-1. PMID: 27798759. -**Other: sST2 biomarker subgroup**
1485. Skobel EC, Sinha AM, Norra C, et al. Effect of cardiac resynchronization therapy on sleep quality, quality of life, and symptomatic depression in patients with chronic heart failure and Cheyne-Stokes respiration. *Sleep Breath.* 2005 Dec;9(4):159-66. - **Addresses only effectiveness, not an RCT**
1486. Slim M, Guedri Y, Neffati E, et al. The implantable cardioverter defibrillator: Indications and follow-up. *Tunis Med.* 2017 Apr;95(4):242-8. PMID: 29492927. – **Not in English**
1487. Slyngstad T, Huth Ruwald AC, Kutiyafa V, et al. Cardiac resynchronization therapy is associated with reductions in left atrial volume and inappropriate implantable cardioverter-defibrillator therapy in MADIT-CRT. *Heart Rhythm.* 2014 Jun;11(6):1001-7. doi: 10.1016/j.hrthm.2014.01.033. PMID: 24502968. - **Addresses only effectiveness, not an RCT**
1488. Slyngstad T, Huth Ruwald AC, Kutiyafa V, et al. Cardiac resynchronization therapy is associated with reductions in left atrial volume and inappropriate implantable cardioverter-defibrillator therapy in MADIT-CRT. *Heart Rhythm.* 2014 Jun;11(6):1001-7. doi: 10.1016/j.hrthm.2014.01.033. PMID: 24502968. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1489. Small RS, Whellan DJ, Boyle A, et al. Implantable device diagnostics on day of discharge identify heart failure patients at increased risk for early readmission for heart failure. *Eur J Heart Fail.* 2013 Dec 28 - **Not relevant to Key Questions**
1490. Smeets CJP, Verbrugge FH, Vranken J, et al. Protocol-driven remote monitoring of cardiac resynchronization therapy as part of a heart failure disease management strategy. *Acta Cardiol.* 2018 Jun;73(3):230-9. doi:

- 10.1080/00015385.2017.1363022.
PMID: 28803515. - **Does not address outcome of interest**
1491. Smith T, Levy WC, Schaer BA, et al. Performance of the Seattle Heart Failure Model in implantable defibrillator patients treated with cardiac resynchronization therapy. *Am J Cardiol.* 2012 2012 Aug 1;110(3):398-402 - **Not relevant to Key Questions**
1492. Smith T, Levy WC, Schaer BA, et al. Performance of the Seattle Heart Failure Model in implantable defibrillator patients treated with cardiac resynchronization therapy. *Am J Cardiol.* 2012 2012 Aug 1;110(3):398-402. - **Addresses only effectiveness, not an RCT**
1493. Smolis-Bak E, Dabrowski R, Piotrowicz E, et al. Hospital-based and telemonitoring guided home-based training program: effects on exercise tolerance and QoL in patients with heart failure, receiving CRT therapy. *European journal of preventive cardiology.* 2015;22(1 SUPPL. 1):S127. doi: 10.1177/2047487315586744. PMID: CN-01103028. - **Not full report**
1494. Sogaard P, Egeblad H, Pedersen AK, et al. Sequential versus simultaneous biventricular resynchronization for severe heart failure: evaluation by tissue Doppler imaging. *Circulation.* 2002 2002 Oct 15;106(16):2078-84 - **Not relevant to Key Questions**
1495. Sogaard P, Egeblad H, Pedersen AK, et al. Sequential versus simultaneous biventricular resynchronization for severe heart failure: evaluation by tissue Doppler imaging. *Circulation.* 2002 2002 Oct 15;106(16):2078-84. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1496. Sogaard P, Kim WY, Jensen HK, et al. Impact of acute biventricular pacing on left ventricular performance and volumes in patients with severe heart failure. A tissue doppler and three-dimensional echocardiographic study. *Cardiology.* 2001 2001;95(4):173-82 - **Not relevant to Key Questions**
1497. Sohal M, Amraoui S, Chen Z, et al. Combined identification of septal flash and absence of myocardial scar by cardiac magnetic resonance imaging improves prediction of response to cardiac resynchronization therapy. *J Interv Card Electrophysiol.* 2014 Aug;40(2):179-90. doi: 10.1007/s10840-014-9907-x. PMID: 24916203. - **Does not address outcome of interest**
1498. Sohal M, Duckett SG, Zhuang X, et al. A prospective evaluation of cardiovascular magnetic resonance measures of dyssynchrony in the prediction of response to cardiac resynchronization therapy. *J Cardiovasc Magn Reson.* 2014 Aug 1;16:58. doi: 10.1186/s12968-014-0058-0. PMID: 25084814 - **Not relevant to Key Questions**

1499. Sohal M, Duckett SG, Zhuang X, et al. A prospective evaluation of cardiovascular magnetic resonance measures of dyssynchrony in the prediction of response to cardiac resynchronization therapy. *J Cardiovasc Magn Reson*. 2014 Aug 1;16:58. doi: 10.1186/s12968-014-0058-0. PMID: 25084814. - **Addresses only effectiveness, not an RCT**
1500. Sohinki D, Ho J, Srinivasan N, et al. Outcomes after atrioventricular node ablation and biventricular pacing in patients with refractory atrial fibrillation and heart failure: a comparison between non-ischaemic and ischaemic cardiomyopathy. *Europace*. 2014 Feb 12 - **Not relevant to Key Questions**
1501. Sohinki D, Ho J, Srinivasan N, et al. Outcomes after atrioventricular node ablation and biventricular pacing in patients with refractory atrial fibrillation and heart failure: a comparison between non-ischaemic and ischaemic cardiomyopathy. *Europace*. 2014 Feb 12. - **Addresses only effectiveness, not an RCT**
1502. Sokal A, Jedrzejczyk E, Lenarczyk R, et al. Efficacy of cardiac resynchronisation therapy in the treatment of end-stage inotrope-dependent heart failure patients. *Kardiol Pol*. 2014;72(9):777-82. doi: 10.5603/KP.a2014.0090. PMID: 24846358. - **Addresses only effectiveness, not an RCT**
1503. Sokal A, Jedrzejczyk E, Lenarczyk R, et al. Efficacy of cardiac resynchronisation therapy in the treatment of end-stage inotrope-dependent heart failure patients. *Kardiol Pol*. 2014;72(9):777-82. doi: 10.5603/KP.a2014.0090. PMID: 24846358. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1504. Sokal A, Lenarczyk R, Kowalski O, et al. Impact of collagen turnover markers on echocardiographic response and mortality after CRT-D implantation in trust-CRT study population. *Europace*. 2015;17:iii231. doi: 10.1093/europace/euv179. PMID: CN-01131341. - **Not full report**
1505. Sokal A, Lenarczyk R, Kowalski O, et al. Prognostic value of collagen turnover biomarkers in cardiac resynchronization therapy: A subanalysis of the TRUST CRT randomized trial population. *Heart Rhythm*. 2016 May;13(5):1088-95. doi: 10.1016/j.hrthm.2015.12.036. PMID: 26776557. - **Addresses only effectiveness, not an RCT**
1506. Soliman OI, Geleijnse ML, Theuns DA, et al. Usefulness of left ventricular systolic dyssynchrony by real-time three-dimensional echocardiography to predict long-term response to cardiac resynchronization therapy. *Am J Cardiol*. 2009 Jun 1;103(11):1586-91 - **Not relevant to Key Questions**
1507. Soliman OI, Theuns DA, van Dalen BM, et al. Prediction of appropriate defibrillator therapy in heart failure patients treated with cardiac resynchronization therapy.

- Am J Cardiol. 2010 2010 Jan 1;105(1):105-11 - **Not relevant to Key Questions**
1508. Soliman OI, van Dalen BM, Nemes A, et al. Quantification of left ventricular systolic dyssynchrony by real-time three-dimensional echocardiography. J Am Soc Echocardiogr. 2009 2009 Mar;22(3):232-9. - **Does not evaluate a CRT**
1509. Soliman OI, van Dalen BM, Nemes A, et al. Quantification of left ventricular systolic dyssynchrony by real-time three-dimensional echocardiography. J Am Soc Echocardiogr. 2009 2009 Mar;22(3):232-9. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1510. Soliman OI, van Dalen BM, Theuns DA, et al. The ischemic etiology of heart failure in diabetics limits reverse left ventricular remodeling after cardiac resynchronization therapy. J Diabetes Complications. 2009 2009 Sep-Oct;23(5):365-70. - **Addresses only effectiveness, not an RCT**
1511. Sommer A, Kronborg MB, Nørgaard BL, et al. Longer inter-lead electrical delay is associated with response to cardiac resynchronization therapy in patients with presumed optimal left ventricular lead position. Europace. 2018;20(10):1630-7. doi: 10.1093/europace/eux384. - **Addresses effectiveness questions only and is not RCT**
1512. Sommer A, Kronborg MB, Nørgaard BL, et al. Multimodality imaging guided left ventricular lead placement improves clinical outcome in cardiac resynchronization therapy: a randomized controlled trial. Heart rhythm. 2015;12(5 SUPPL. 1):S475. PMID: CN-01076065. – **Not full report**
1513. Sommer A, Kronborg MB, Nørgaard BL, et al. Multimodality imaging-guided left ventricular lead placement in cardiac resynchronization therapy: a randomized controlled trial. Eur J Heart Fail. 2016 Nov;18(11):1365-74. doi: 10.1002/ejhf.530. PMID: 27087019. - **Does not address outcome of interest**
1514. Sommer A, Kronborg MB, Witt CT, et al. The paced electrocardiogram cannot be used to identify left and right ventricular pacing sites in cardiac resynchronization therapy: validation by cardiac computed tomography. Europace. 2015 Mar;17(3):432-8. doi: 10.1093/europace/euu323. PMID: 25480941. - **Does not address outcome of interest**
1515. Sonne C, Bott-Flugel L, Hauck S, et al. Three-dimensional echocardiographic optimization improves outcome in cardiac resynchronization therapy compared to ECG optimization: a randomized comparison. Pacing Clin Electrophysiol. 2014 Mar;37(3):312-20. doi: 10.1111/pace.12281. PMID: 24164640. -**Other: prior review**
1516. Sood N, Ruwald AC, Solomon S, et al. Association between myocardial substrate, implantable

- cardioverter defibrillator shocks and mortality in MADIT-CRT. Eur Heart J. 2014 Jan;35(2):106-15. doi: 10.1093/eurheartj/eh451. PMID: 24179073. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1517. Sosdean R, Mornos C, Enache B, et al. Safety and feasibility of biventricular devices reuse in general and elderly population--a single-center retrospective cohort study. Clin Interv Aging. 2015;10:1311-8. doi: 10.2147/cia.s88805. PMID: 26316726. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1518. Soylyu MO, Altun I, Basaran O, et al. Impact of QRS morphology on heart rate turbulence and heart rate variability after cardiac resynchronization therapy in patients with heart failure. Eur Rev Med Pharmacol Sci. 2016;20(2):317-22. PMID: 26875903. - **Does not address outcome of interest**
1519. Spinale FG, Meyer TE, Stolen CM, et al. Development of a biomarker panel to predict cardiac resynchronization therapy response: Results from the SMART-AV trial. Heart Rhythm. 2019;16(5):743-53. doi: 10.1016/j.hrthm.2018.11.026. - **Does not address outcome of interest**
1520. Sridhar AR, Yarlagadda V, Parasa S, et al. Cardiac Resynchronization Therapy: US Trends and Disparities in Utilization and Outcomes. Circ Arrhythm Electrophysiol. 2016 Mar;9(3):e003108. doi: 10.1161/circep.115.003108. PMID: 26921376. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1521. St John Sutton M, Cerkenvenik J, Borlaug BA, et al. Effects of Cardiac Resynchronization Therapy on Cardiac Remodeling and Contractile Function: Results From Resynchronization Reverses Remodeling in Systolic Left Ventricular Dysfunction (REVERSE). J Am Heart Assoc. 2015 Sep 11;4(9):e002054. doi: 10.1161/jaha.115.002054. PMID: 26363005. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1522. St John Sutton M, Ghio S, Plappert T, et al. Cardiac resynchronization induces major structural and functional reverse remodeling in patients with New York Heart Association class I/II heart failure. Circulation. 2009 Nov 10;120(19):1858-65. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1523. St John Sutton M, Linde C, Gold MR, et al. Left Ventricular Architecture, Long-Term Reverse Remodeling, and Clinical Outcome in Mild Heart Failure With Cardiac Resynchronization: Results From the REVERSE Trial. JACC Heart Fail. 2017 Mar;5(3):169-78. doi: 10.1016/j.jchf.2016.11.012. PMID: 28254122. - **Population inclusion criteria do not fall**

- within the QRS \geq 120ms and LVEF \leq 35% range**
1524. St John Sutton M, Plappert T, Adamson PB, et al. Left Ventricular Reverse Remodeling With Biventricular Versus Right Ventricular Pacing in Patients With Atrioventricular Block and Heart Failure in the BLOCK HF Trial. *Circ Heart Fail.* 2015 May;8(3):510-8. doi: 10.1161/circheartfailure.114.001626. PMID: 25697851. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1525. St John Sutton M. Cardiac resynchronization therapy and reduced risk of death and nonfatal heart failure events. *Curr Heart Fail Rep.* 2009 2009 Dec;6(4):211-2. – **No original data**
1526. St John Sutton M. Cardiac resynchronization therapy and reduced risk of death and nonfatal heart failure events. *Curr Heart Fail Rep.* 2009 2009 Dec;6(4):211-2. – **Not full report**
1527. Stabile G, Bianchi V, Solimene F, et al. Maximization of interventricular conduction time by means of quadripolar leads for cardiac resynchronization therapy. *J Interv Card Electrophysiol.* 2017 Oct;50(1):111-5. doi: 10.1007/s10840-017-0279-x. PMID: 28798987. - **Does not address outcome of interest**
1528. Stabile G, D'Agostino C, Gallo P, et al. Appropriate therapies predict long-term mortality in primary and secondary prevention of sudden cardiac death. *J Cardiovasc Med (Hagerstown).* 2013 2013 Feb;14(2):110-3. - **Does not evaluate a CRT**
1529. Stabile G, D'Agostino C, Gallo P, et al. Appropriate therapies predict long-term mortality in primary and secondary prevention of sudden cardiac death. *J Cardiovasc Med (Hagerstown).* 2013 2013 Feb;14(2):110-3 - **Not relevant to Key Questions**
1530. Stabile G, D'Onofrio A, Pepi P, et al. Interlead anatomic and electrical distance predict outcome in CRT patients. *Heart Rhythm.* 2015 Nov;12(11):2221-9. doi: 10.1016/j.hrthm.2015.05.020. PMID: 26001509. - **Addresses only effectiveness, not an RCT**
1531. Stabile G, Pepi P, Palmisano P, et al. Adherence to 2016 European Society of Cardiology guidelines predicts outcome in a large real-world population of heart failure patients requiring cardiac resynchronization therapy. *Heart Rhythm.* 2018 Apr 14doi: 10.1016/j.hrthm.2018.04.011. PMID: 29665405. - **Addresses only effectiveness, not an RCT**
1532. Stanchina ML, Ellison K, Malhotra A, et al. The impact of cardiac resynchronization therapy on obstructive sleep apnea in heart failure patients: a pilot study. *Chest.* 2007 2007 Aug;132(2):433-9. - **Addresses only effectiveness, not an RCT**
1533. Stanciu AE, Vatasescu RG, Stanciu MM, et al. Cardiac resynchronization therapy in patients with chronic heart failure is associated with anti-

- inflammatory and anti-remodeling effects. Clin Biochem. 2013 2013 Feb;46(3):230-4. - **Addresses only effectiveness, not an RCT**
1534. Stankovic I, Aarones M, Smith H-J, et al. Dynamic relationship of left-ventricular dyssynchrony and contractile reserve in patients undergoing cardiac resynchronization therapy. Eur Heart J. 2014 2014;35(1):48-55a - **Not relevant to Key Questions**
1535. Stankovic I, Prinz C, Ciarka A, et al. Long-Term Outcome After CRT in the Presence of Mechanical Dyssynchrony Seen With Chronic RV Pacing or Intrinsic LBBB. JACC: Cardiovascular Imaging. 2017;10(10):1091-9. doi: 10.1016/j.jcmg.2016.08.015. - **Does not address outcome of interest**
1536. Stankovic I, Prinz C, Ciarka A, et al. Relationship of visually assessed apical rocking and septal flash to response and long-term survival following cardiac resynchronization therapy (PREDICT-CRT). Eur Heart J Cardiovasc Imaging. 2016 Mar;17(3):262-9. doi: 10.1093/ehjci/jev288. PMID: 26588984. - **Does not address outcome of interest**
1537. Stanton T, Haluska BA, Leano R, et al. Hemodynamic benefit of rest and exercise optimization of cardiac resynchronization therapy. Echocardiography. 2014 2014.- **Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
1538. Starling RC, Krum H, Bril S, et al. Impact of a Novel Adaptive Optimization Algorithm on 30-Day Readmissions: Evidence From the Adaptive CRT Trial. JACC Heart Fail. 2015 Jul;3(7):565-72. doi: 10.1016/j.jchf.2015.03.001. PMID: 26071616. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1539. Starling RC, Krum H, Bril S, et al. Impact of novel adaptive optimization algorithms on 30-day readmissions: evidence from the adaptive CRT trial. Heart rhythm. 2014;11(5 SUPPL. 1):S155. doi: 10.1016/j.hrthm.2014.03.028. PMID: CN-01060580. - **Not full report**
1540. Steelant B, Stankovic I, Roijackers I, et al. The Impact of Infarct Location and Extent on LV Motion Patterns: Implications for Dyssynchrony Assessment. JACC Cardiovasc Imaging. 2016 Jun;9(6):655-64. doi: 10.1016/j.jcmg.2015.07.021. PMID: 27085438. - **Addresses only effectiveness, not an RCT**
1541. Stefan L, Sedlacek K, Cerna D, et al. Small left atrium and mild mitral regurgitation predict super-response to cardiac resynchronization therapy. Europace. 2012 2012 Nov;14(11):1608-14. - **Addresses only effectiveness, not an RCT**
1542. Steffel J, Hurlimann A, Starck C, et al. Long-term performance of modern coronary sinus leads in

- cardiac resynchronization therapy. Indian Pacing Electrophysiol J. 2014 May;14(3):112-20. PMID: 24948850 - **Not relevant to Key Questions**
1543. Steffel J, Hurlimann A, Starck C, et al. Long-term performance of modern coronary sinus leads in cardiac resynchronization therapy. Indian Pacing Electrophysiol J. 2014 May;14(3):112-20. PMID: 24948850. - **Does not address outcome of interest**
1544. Steffel J, Rempel H, Breitenstein A, et al. Comprehensive cardiac resynchronization therapy optimization in the real world. Cardiol J. 2014;21(3):316-24. doi: 10.5603/cj.a2013.0123. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1545. Steffel J, Ruschitzka F. Superresponse to cardiac resynchronization therapy. Circulation. 2014 Jul 1;130(1):87-90. doi: 10.1161/circulationaha.113.006124. PMID: 24982120. - **No original data**
1546. Steffel J, Ruschitzka F. Superresponse to cardiac resynchronization therapy. Circulation. 2014 Jul 1;130(1):87-90. doi: 10.1161/circulationaha.113.006124. PMID: 24982120. - **Single case study**
1547. Steffel J, Varma N, Robertson M, et al. Effect of Gender on Outcomes After Cardiac Resynchronization Therapy in Patients With a Narrow QRS Complex: A Subgroup Analysis of the EchoCRT Trial. Circ Arrhythm Electrophysiol. 2016 Jun;9(6)doi: 10.1161/circep.115.003924. PMID: 27282848. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1548. Steinberg BA, Wehrenberg S, Jackson KP, et al. Atrioventricular and ventricular-to-ventricular programming in patients with cardiac resynchronization therapy: results from ALTITUDE. J Interv Card Electrophysiol. 2015 Dec;44(3):279-87. doi: 10.1007/s10840-015-0058-5. PMID: 26400764. - **Does not address outcome of interest**
1549. Stellbrink C, Auricchio A, Diem B, et al. Potential benefit of biventricular pacing in patients with congestive heart failure and ventricular tachyarrhythmia. Am J Cardiol. 1999 1999 Mar 11;83(5B):143D-50D. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1550. Stellbrink C, Breithardt OA, Franke A, et al. Impact of cardiac resynchronization therapy using hemodynamically optimized pacing on left ventricular remodeling in patients with congestive heart failure and ventricular conduction disturbances. J Am Coll Cardiol. 2001 2001 Dec;38(7):1957-65.- **Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and**

- does not include at least 30 patients.**
1551. Sterlinski M, Sokal A, Lenarczyk R, et al. In Heart Failure Patients with Left Bundle Branch Block Single Lead MultiSpot Left Ventricular Pacing Does Not Improve Acute Hemodynamic Response To Conventional Biventricular Pacing. A Multicenter Prospective, Interventional, Non-Randomized Study. PLoS One. 2016;11(4):e0154024. doi: 10.1371/journal.pone.0154024. PMID: 27124724. - **Does not address outcome of interest**
1552. Stern J, Heist EK, Murray L, et al. Elevated estimated pulmonary artery systolic pressure is associated with an adverse clinical outcome in patients receiving cardiac resynchronization therapy. Pacing Clin Electrophysiol. 2007 May;30(5):603-7.-**Other: not adjusted for our variables**
1553. Sticherling C, Muller D, Schaefer BA, et al. Atrial electrogram quality in single-pass defibrillator leads with floating atrial bipole in patients with permanent atrial fibrillation and cardiac resynchronization therapy. Indian Pacing Electrophysiol J. 2018 Jul - Aug;18(4):140-5. doi: 10.1016/j.ipej.2018.03.005. PMID: 29596906. - **Does not address outcome of interest**
1554. Stolen CM, Adourian A, Meyer TE, et al. Plasma galectin-3 and heart failure outcomes in MADIT-CRT (multicenter automatic defibrillator implantation trial with cardiac resynchronization therapy). J Card Fail. 2014 Nov;20(11):793-9. doi: 10.1016/j.cardfail.2014.07.018. PMID: 25106783. - **Addresses only effectiveness, not an RCT**
1555. Stolen KQ, Kemppainen J, Kalliokoski KK, et al. Myocardial perfusion reserve and oxidative metabolism contribute to exercise capacity in patients with dilated cardiomyopathy. J Card Fail. 2004 Apr;10(2):132-40. - **Does not evaluate a CRT**
1556. Stolen KQ, Kemppainen J, Kalliokoski KK, et al. Myocardial perfusion reserve and oxidative metabolism contribute to exercise capacity in patients with dilated cardiomyopathy. J Card Fail. 2004 Apr;10(2):132-40 - **Not relevant to Key Questions**
1557. Stolfo D, Tonet E, Barbati G, et al. Acute Hemodynamic Response to Cardiac Resynchronization in Dilated Cardiomyopathy: Effect on Late Mitral Regurgitation. Pacing Clin Electrophysiol. 2015 Nov;38(11):1287-96. doi: 10.1111/pace.12731. PMID: 26256433. - **Addresses only effectiveness, not an RCT**
1558. Stolfo D, Tonet E, Merlo M, et al. Early right ventricular response to cardiac resynchronization therapy: impact on clinical outcomes. Eur J Heart Fail. 2016 Feb;18(2):205-13. doi: 10.1002/ejhf.450. PMID: 26635250. - **Does not address outcome of interest**
1559. Stollberger C, Blazek G, Bucher E, et al. Cardiac resynchronization therapy in left ventricular hypertrabeculation/non-compaction and myopathy. Europace. 2008 2008

- Jan;10(1):59-62. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1560. Storkås HS, Hansen TF, Tahri JB, et al. Left axis deviation in patients with left bundle branch block is a marker of myocardial disease associated with poor response to cardiac resynchronization therapy. J Electrocardiol. 2019doi: 10.1016/j.jelectrocard.2019.04.007. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1561. Strik M, Ploux S, Huntjens PR, et al. Response to cardiac resynchronization therapy is determined by intrinsic electrical substrate rather than by its modification. Int J Cardiol. 2018 Nov 1;270:143-8. doi: 10.1016/j.ijcard.2018.06.005. PMID: 29895424. - **Does not address outcome of interest**
1562. Sugano A, Seo Y, Yamamoto M, et al. Optimal cut-off value of reverse remodeling to predict long-term outcome after cardiac resynchronization therapy in patients with ischemic cardiomyopathy. J Cardiol. 2017 Feb;69(2):456-61. doi: 10.1016/j.jjcc.2016.01.016. PMID: 26947101. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1563. Suleiman M, Goldenberg I, Haim M, et al. Clinical characteristics and outcomes of elderly patients treated with an implantable cardioverter-defibrillator or cardiac resynchronization therapy in a real-world setting: Data from the Israeli ICD Registry. Heart Rhythm. 2014 2014 Mar;11(3):435-41. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1564. Suleiman M, Goldenberg I, Samniah N, et al. Outcome of Patients with Advanced Heart Failure Who Receive Device-Based Therapy for Primary Prevention of Sudden Cardiac Death: Insights from the Israeli ICD Registry. Pacing Clin Electrophysiol. 2015 Jun;38(6):738-45. doi: 10.1111/pace.12627. PMID: 25754272. - **Does not address outcome of interest**
1565. Sullivan RM, Murillo J, Gerritse B, et al. Do baseline diastolic echocardiographic parameters predict outcome after resynchronization therapy? Results from the PROSPECT trial. Pacing Clin Electrophysiol. 2013 2013 Feb;36(2):214-20 - **Not relevant to Key Questions**
1566. Sullivan RM, Murillo J, Gerritse B, et al. Do baseline diastolic echocardiographic parameters predict outcome after resynchronization therapy? Results from the PROSPECT trial. PACE - Pacing and Clinical Electrophysiology. 2013;36(2):214-20. doi: 10.1111/pace.12042. PMID: 23121136. - **Does not address outcome of interest**
1567. Sundaram V, Sahadevan J, Waldo AL, et al. Implantable Cardioverter-Defibrillators With

- Versus Without Resynchronization Therapy in Patients With a QRS Duration >180 ms. *J Am Coll Cardiol*. 2017 Apr 25;69(16):2026-36. doi: 10.1016/j.jacc.2017.02.042. PMID: 28427578. - **Addresses only effectiveness, not an RCT**
1568. Sundell J, Engblom E, Koistinen J, et al. The effects of cardiac resynchronization therapy on left ventricular function, myocardial energetics, and metabolic reserve in patients with dilated cardiomyopathy and heart failure. *J Am Coll Cardiol*. 2004 2004 Mar 17;43(6):1027-33 - **Not relevant to Key Questions**
1569. Sunman H, Canpolat U, Yorgun H, et al. Association between reverse electrical remodeling and cardiac fibrosis markers in patients with cardiac resynchronization therapy. *Turk Kardiyol Dern Ars*. 2018 Mar;46(2):84-91. doi: 10.5543/tkda.2017.80236. PMID: 29512624. - **Does not address outcome of interest**
1570. Sunman H, Ozkan A, Yorgun H, et al. Vitamin D levels predict the response to cardiac resynchronization therapy in patients with systolic heart failure. *Turk Kardiyol Dern Ars*. 2016 Dec;44(8):670-6. doi: 10.5543/tkda.2016.28848. PMID: 28045413. - **Does not address outcome of interest**
1571. Sunsaneewitayakul B, Sitthisook S, Sangwatanaroj S, et al. Feasibility, safety, and mid-term efficacy of cardiac resynchronization therapy in patients with severe heart failure and ventricular conduction delay: Chulalongkorn experience. *J Med Assoc Thai*. 2007 2007 Jul;90(7):1458-66 - **Not relevant to Key Questions**
1572. Suzuki A, Shiga T, Yagishita D, et al. Narrowing filtered QRS duration on signal-averaged electrocardiogram predicts outcomes in cardiac resynchronization therapy patients with nonischemic heart failure. *Ann Noninvasive Electrocardiol*. 2018 May;23(3):e12523. doi: 10.1111/anec.12523. PMID: 29194868. - **Other: Baseline QRS not reported**
1573. Suzuki H, Nodera M, Kamioka M, et al. Intracardiac impedance after cardiac resynchronization therapy is a novel predictor for worsening of heart failure. *Heart Vessels*. 2017 Aug;32(8):926-31. doi: 10.1007/s00380-017-0953-z. PMID: 28181011. - **Does not address outcome of interest**
1574. Sweeney MO, Hellkamp AS, Ellenbogen KA, et al. Reduced ejection fraction, sudden cardiac death, and heart failure death in the mode selection trial (MOST): implications for device selection in elderly patients with sinus node disease. *J Cardiovasc Electrophysiol*. 2008 2008 Nov;19(11):1160-6. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1575. Sweeney MO, Hellkamp AS, van Bommel RJ, et al. QRS fusion complex analysis using wave interference to predict reverse remodeling during cardiac resynchronization therapy. *Heart*

- Rhythm. 2014 May;11(5):806-13. doi: 10.1016/j.hrthm.2014.01.021. PMID: 24462523. - **Addresses only effectiveness, not an RCT**
1576. Sweeney MO, Sakaguchi S, Simons G, et al. Response to the Center for Medicare & Medicaid Services coverage with evidence development request for primary prevention implantable cardioverter-defibrillators: data from the OMNI study. Heart Rhythm. 2012 2012 Jul;9(7):1058-66 - **Not relevant to Key Questions**
1577. Sweeney MO, van Bommel RJ, Schalij MJ, et al. Analysis of ventricular activation using surface electrocardiography to predict left ventricular reverse volumetric remodeling during cardiac resynchronization therapy. Circulation. 2010 2010 Feb 9;121(5):626-34 - **Not relevant to Key Questions**
1578. Swindle J, Burroughs TE, Schnitzler MA, et al. Short-term mortality and cost associated with cardiac device implantation in patients hospitalized with heart failure. Am Heart J. 2008 2008 Aug;156(2):322-8. - **Does not evaluate a CRT**
1579. Swindle J, Burroughs TE, Schnitzler MA, et al. Short-term mortality and cost associated with cardiac device implantation in patients hospitalized with heart failure. Am Heart J. 2008 2008 Aug;156(2):322-8. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1580. Szepietowska B, Kutyla V, Ruwald MH, et al. Effect of Cardiac Resynchronization Therapy in Patients With Insulin-Treated Diabetes Mellitus. Am J Cardiol. 2015 Aug 1;116(3):393-9. doi: 10.1016/j.amjcard.2015.04.053. PMID: 26048851. -**Other: same patients included in the main study with 1820 subjects.**
1581. Szepietowska B, McNitt S, Polonsky B, et al. Metabolic syndrome is associated with different clinical outcome after cardiac resynchronization therapy in patients with ischemic and non-ischemic cardiomyopathy. Cardiol J. 2016;23(3):344-51. doi: 10.5603/CJ.a2016.0017. PMID: 27064797.-**Other: same patients included in the main study with 1820 subjects.**
1582. Szepietowska B, McNitt S, Polonsky B, et al. Relation of body mass index to the risk of supraventricular tachyarrhythmias in patients with heart failure. Heart rhythm. Conference: 38th annual scientific sessions of the heart rhythm society, heart rhythm 2017. United states. 2017;14(5 Supplement 1):S295. PMID: CN-01400215. – **Not full report**
1583. Szepietowska B, Polonsky B, Sherazi S, et al. Effect of obesity on the effectiveness of cardiac resynchronization to reduce the risk of first and recurrent ventricular tachyarrhythmia events. Cardiovasc Diabetol. 2016 Jul 7;15:93. doi: 10.1186/s12933-016-0401-x. PMID: 27388610. - **Population inclusion criteria do**

**not fall within the QRS \geq 120ms
and LVEF \leq 35% range**

1584. Szepietowska B, Sherazi S, McNitt S, et al. Effect of obesity on the risk of appropriate implantable cardioverter-defibrillator therapy in MADIT-CRT. *Heart rhythm*. 2015;12(5 SUPPL. 1):S217-S8. PMID: CN-01089003. – **Not full report**
1585. Szeplaki G, Boros AM, Szilagy S, et al. Complement C3a predicts outcome in cardiac resynchronization therapy of heart failure. *Inflamm Res*. 2016 Dec;65(12):933-40. doi: 10.1007/s00011-016-0976-4. PMID: 27492980. - **Addresses only effectiveness, not an RCT**
1586. Szulik M, Sliwinska A, Lenarczyk R, et al. 3D and 2D left ventricular systolic function imaging-- from ejection fraction to deformation. *Cardiac resynchronization therapy--substudy*. *Acta Cardiol*. 2015 Feb;70(1):21-30. doi: 10.2143/ac.70.1.3064590. PMID: 26137800. - **Does not address outcome of interest**
1587. Szulik M, Sredniawa B, Streb W, et al. Sleep-disordered breathing and echocardiographic measures of function and dyssynchrony: a complex approach to cardiac resynchronization therapy. *J Cardiovasc Med (Hagerstown)*. 2016 Dec;17(12):886-95. doi: 10.2459/jcm.000000000000162. PMID: 25022934. - **Does not address outcome of interest**
1588. Szulik M, Stabryla-Deska J, Boidol J, et al. Echocardiography-based qualification and response assessment to cardiac resynchronization therapy in patients with chronic heart failure. The matrix metalloproteinase-9 substudy. *Kardiol Pol*. 2011 2011;69(10):1043-51 - **Not relevant to Key Questions**
1589. Szulik M, Stabryla-Deska J, Boidol J, et al. Echocardiography-based qualification and response assessment to cardiac resynchronization therapy in patients with chronic heart failure. The matrix metalloproteinase-9 substudy. *Kardiol Pol*. 2011 2011;69(10):1043-51. - **Addresses only effectiveness, not an RCT**
1590. Tabereaux PB, Doppalapudi H, Kay GN, et al. Limited response to cardiac resynchronization therapy in patients with concomitant right ventricular dysfunction. *J Cardiovasc Electrophysiol*. 2010 2010 Apr;21(4):431-5 - **Not relevant to Key Questions**
1591. Tada H, Toide H, Naito S, et al. Tissue Doppler imaging and strain Doppler imaging as modalities for predicting clinical improvement in patients receiving biventricular pacing. *Circ J*. 2005 2005 Feb;69(2):194-200.-**Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
1592. Tajstra M, Gadula-Gacek E, Kurek A, et al. Complications in recipients of cardioverter-defibrillator or cardiac resynchronization therapy:

- Insights from Silesian Center Defibrillator registry. *Cardiol J.* 2017;24(5):515-22. doi: 10.5603/CJ.a2016.0092. PMID: 27734455. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1593. Takamatsu H, Tada H, Okaniwa H, et al. Right bundle branch block and impaired left ventricular function as evidence of a left ventricular conduction delay. *Circ. J.* 2008;72(1):120-6. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1594. Takemoto M, Sakamoto M, Kawagoe J, et al. Effect of biventricular pacing therapy in patients with dilated cardiomyopathy with severe congestive heart failure. *Jpn J Thorac Cardiovasc Surg.* 2004 Apr;52(4):175-80. - **Addresses only effectiveness, not an RCT**
1595. Tanaka Y, Tada H, Yamashita E, et al. Change in blood pressure just after initiation of cardiac resynchronization therapy predicts long-term clinical outcome in patients with advanced heart failure. *Circ J.* 2009 2009 Feb;73(2):288-94. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1596. Tao N, Qiu Y, Tang H, et al. Assessment of left ventricular contraction patterns using gated SPECT MPI to predict cardiac resynchronization therapy response. *J Nucl Cardiol.* 2017 Jun 12doi: 10.1007/s12350-017-0949-1. PMID: 28608184. - **Does not address outcome of interest**
1597. Tarquini R, Guerra CT, Porciani MC, et al. Effects of cardiac resynchronization therapy on systemic inflammation and neurohormonal pathways in heart failure. *Cardiol J.* 2009 2009;16(6):545-52 - **Not relevant to Key Questions**
1598. Tatsumi K, Tanaka H, Matsumoto K, et al. Combined baseline strain dyssynchrony index and its acute reduction predicts mid-term left ventricular reverse remodeling and long-term outcome after cardiac resynchronization therapy. *Echocardiography.* 2014 Apr;31(4):464-73. doi: 10.1111/echo.12405. PMID: 24138588. - **Addresses only effectiveness, not an RCT**
1599. Tayal B, Gorcsan J, 3rd, Bax JJ, et al. Cardiac Resynchronization Therapy in Patients With Heart Failure and Narrow QRS Complexes. *J Am Coll Cardiol.* 2018 Mar 27;71(12):1325-33. doi: 10.1016/j.jacc.2018.01.042. PMID: 29566816. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1600. Tayal B, Gorcsan J, 3rd, Delgado-Montero A, et al. Mechanical Dyssynchrony by Tissue Doppler Cross-Correlation is Associated with Risk for Complex Ventricular Arrhythmias after Cardiac Resynchronization Therapy. *J Am Soc Echocardiogr.* 2015 Dec;28(12):1474-81. doi: 10.1016/j.echo.2015.07.021.

- PMID: 26342653. - **Addresses only effectiveness, not an RCT**
1601. Tayal B, Gorcsan J, Bax J, et al. Prognostic significance of activation delay by cross correlation analysis using tissue doppler imaging in patients with heart failure and narrow QRS duration an echocardiography guided cardiac resynchronization therapy (Echo-CRT) trial substudy of patients not randomized to CRT. *Circulation. Conference: resuscitation science symposium, res 2017. United states. 2017;136(Supplement 1) (no pagination)* PMID: CN-01438552. – **Not full report**
1602. Tayal B, Sogaard P, Delgado-Montero A, et al. Interaction of Left Ventricular Remodeling and Regional Dyssynchrony on Long-Term Prognosis after Cardiac Resynchronization Therapy. *J Am Soc Echocardiogr.* 2017 Mar;30(3):244-50. doi: 10.1016/j.echo.2016.11.010. PMID: 27986357. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1603. Taylor RJ, Umar F, Panting JR, et al. Left ventricular lead position, mechanical activation, and myocardial scar in relation to left ventricular reverse remodeling and clinical outcomes after cardiac resynchronization therapy: A feature-tracking and contrast-enhanced cardiovascular magnetic resonance study. *Heart Rhythm.* 2016 Feb;13(2):481-9. doi: 10.1016/j.hrthm.2015.10.024. PMID: 26498258. - **Does not address outcome of interest**
1604. Tedrow UB, Kramer DB, Stevenson LW, et al. Relation of right ventricular peak systolic pressure to major adverse events in patients undergoing cardiac resynchronization therapy. *Am J Cardiol.* 2006 2006 Jun 15;97(12):1737-40. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1605. Tepper D. Frontiers in congestive heart failure: initial experience with an implantable cardioverter-defibrillator incorporating cardiac resynchronization therapy. *Congest Heart Fail.* 2002 2002 Mar-Apr;8(2):91. - **Does not evaluate a CRT**
1606. Tepper D. Frontiers in congestive heart failure: initial experience with an implantable cardioverter-defibrillator incorporating cardiac resynchronization therapy. *Congest Heart Fail.* 2002 2002 Mar-Apr;8(2):91. – **Not full report**
1607. Tepper D. Frontiers in congestive heart failure: Ventricular contraction abnormalities in dilated cardiomyopathy: effect of biventricular pacing to correct interventricular dyssynchrony. *Congest Heart Fail.* 2000 2000 Jul-Aug;6(4):224. – **No original data**
1608. Tepper D. Frontiers in congestive heart failure: Ventricular contraction abnormalities in dilated cardiomyopathy: effect of biventricular pacing to correct interventricular dyssynchrony. *Congest Heart Fail.* 2000 2000 Jul-Aug;6(4):224. – **Not full report**

1609. Ter Horst IA, van 't Sant J, Wijers SC, et al. The risk of ventricular arrhythmias in a Dutch CRT population: CRT-defibrillator versus CRT-pacemaker. *Neth Heart J*. 2016 Mar;24(3):204-13. doi: 10.1007/s12471-015-0800-8. PMID: 26797979. - **Does not address outcome of interest**
1610. Ter Horst IAH, Bogaard MD, Tuinenburg AE, et al. The concept of triple wavefront fusion during biventricular pacing: Using the EGM to produce the best acute hemodynamic improvement in CRT. *Pacing Clin Electrophysiol*. 2017 Jul;40(7):873-82. doi: 10.1111/pace.13118. PMID: 28543106. - **Addresses only effectiveness, not an RCT**
1611. Ter Horst IAH, Kuijpers Y, Van 't SJ, et al. "Are CRT upgrade procedures more complex and associated with more complications than de novo CRT implantations?" A single centre experience. *Netherlands Heart Journal*. 2016;24(1):75-81. doi: 10.1007/s12471-015-0771-9. - **Does not address outcome of interest**
1612. Tereshchenko LG, Cheng A, Park J, et al. Novel measure of electrical dyssynchrony predicts response in cardiac resynchronization therapy: Results from the SMART-AV Trial. *Heart Rhythm*. 2015 Dec;12(12):2402-10. doi: 10.1016/j.hrthm.2015.08.009. PMID: 26272523. - **Does not address outcome of interest**
1613. Tereshchenko LG, Henrikson CA, Berger RD. Strong coherence between heart rate variability and intracardiac repolarization lability during biventricular pacing is associated with reverse electrical remodeling of the native conduction and improved outcome. *J Electrocardiol*. 2011 Nov-Dec;44(6):713-7 - **Not relevant to Key Questions**
1614. Tereshchenko LG, Henrikson CA, Stempniewicz P, et al. Antiarrhythmic effect of reverse electrical remodeling associated with cardiac resynchronization therapy. *Pacing Clin Electrophysiol*. 2011 Mar;34(3):357-64 - **Not relevant to Key Questions**
1615. Thackray SD, Witte KK, Nikitin NP, et al. The prevalence of heart failure and asymptomatic left ventricular systolic dysfunction in a typical regional pacemaker population. *Eur Heart J*. 2003 Jun;24(12):1143-52. - **Does not evaluate a CRT**
1616. Thackray SD, Witte KK, Nikitin NP, et al. The prevalence of heart failure and asymptomatic left ventricular systolic dysfunction in a typical regional pacemaker population. *Eur Heart J*. 2003 Jun;24(12):1143-52. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1617. Theodorakis G, Katsikis A, Livanis E, et al. Long term effects of cardiac resynchronization therapy in non-ambulatory NYHA IV heart failure patients. *Pacing Clin Electrophysiol*. 2011 Nov;34(11):1553-60 - **Not relevant to Key Questions**

1618. Thibault B, Clementy N, Arnold M, et al. Cardiac resynchronization does not improve renal function in patients with cardiorenal syndrome - Insight from the resynchronization- defibrillation for ambulatory heart failure trial (RAFT). *Heart rhythm*. 2013;10(5 SUPPL. 1):S369. PMID: CN-01027231. – **Not full report**
1619. Thibault B, Ritter P, Bode K, et al. Dynamic programming of atrioventricular delay improves electrical synchrony in a multicenter cardiac resynchronization therapy study. *Heart Rhythm*. 2019 Jan 23doi: 10.1016/j.hrthm.2019.01.020. PMID: 30682433. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1620. Thomas S, Moss AJ, Zareba W, et al. Age-related long-term benefit of cardiac resynchronization therapy in LBBB patients-a MADIT-CRT long-term follow-up substudy. *Circulation*. 2014;130 PMID: CN-01056058. – **Not full report**
1621. Thomas S, Moss AJ, Zareba W, et al. Cardiac Resynchronization in Different Age Groups: A MADIT-CRT Long-Term Follow-Up Substudy. *J Card Fail*. 2016 Feb;22(2):143-9. doi: 10.1016/j.cardfail.2015.09.015. PMID: 26433087. -**Other: same patients included in the main study with 1820 subjects.**
1622. Thoren E, Kesek M, Jideus L. The effect of concomitant cardiac resynchronization therapy on quality of life in patients with heart failure undergoing cardiac surgery. *Open Cardiovasc Med J*. 2014 2014;8:18-22. - **Addresses only effectiveness, not an RCT**
1623. Thorén E, Kesek M, Jidéus L. The effect of concomitant cardiac resynchronization therapy on quality of life in patients with heart failure undergoing cardiac surgery. *Open Cardiovascular Medicine Journal*. 2014;8(1):18-22. doi: 10.2174/1874192401408010018. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1624. Thosani AJ, Liu E, Shaw G, et al. Rapid reversal of right ventricular pacing-induced cardiomyopathy by His bundle pacing. *HeartRhythm Case Rep*. 2017 Mar;3(3):189-91. doi: 10.1016/j.hrcr.2017.01.004. PMID: 28791212. – **Single case study**
1625. To AC, Benatti RD, Sato K, et al. Strain-time curve analysis by speckle tracking echocardiography in cardiac resynchronization therapy: Insight into the pathophysiology of responders vs. non-responders. *Cardiovasc Ultrasound*. 2016 Apr 18;14:14. doi: 10.1186/s12947-016-0057-4. PMID: 27090784. - **Does not address outcome of interest**
1626. Toff WD, Camm AJ, Skehan JD. Single-chamber versus dual-chamber pacing for high-grade atrioventricular block. *N Engl J Med*. 2005 2005 Jul 14;353(2):145-55. - **Does not evaluate a CRT**

1627. Toff WD, Camm AJ, Skehan JD. Single-chamber versus dual-chamber pacing for high-grade atrioventricular block. *N Engl J Med*. 2005 Jul 14;353(2):145-55 - **Not relevant to Key Questions**
1628. Toggweiler S, Zuber M, Erne P. Optimization of atrioventricular and interventricular delay with acoustic cardiography in biventricular pacing. *Congest Heart Fail*. 2006 Jul-Aug;12 Suppl 1:37-40. – **Single case study**
1629. Tolosana JM, Hernandez Madrid A, Brugada J, et al. Comparison of Benefits and Mortality in Cardiac Resynchronization Therapy in Patients With Atrial Fibrillation Versus Patients in Sinus Rhythm (Results of the Spanish Atrial Fibrillation and Resynchronization [SPARE] Study). *Am. J. Cardiol*. 2008;102(4):444-9 - **Not relevant to Key Questions**
1630. Tolosana JM, Hernandez Madrid A, Brugada J, et al. Comparison of benefits and mortality in cardiac resynchronization therapy in patients with atrial fibrillation versus patients in sinus rhythm (Results of the Spanish Atrial Fibrillation and Resynchronization. *Am J Cardiol*. 2008 Aug 15;102(4):444-9. - **Addresses only effectiveness, not an RCT**
1631. Tomassoni G, Baker J, Corbisiero R, et al. Postoperative performance of the Quartet(R) left ventricular heart lead. *J Cardiovasc Electrophysiol*. 2013 Apr;24(4):449-56.-**Other: technical**
1632. Tomassoni G, Baker J, Corbisiero R, et al. Safety and efficacy of multipoint pacing in cardiac resynchronization therapy: the multipoint pacing (MPP) ide study. *Europace*. Conference: world congress in cardiac electrophysiology and cardiac techniques 2016. France. 2016;18:i84. doi: 10.1093/europace/euw158. PMID: CN-01406403. – **Not full report**
1633. Tomassoni GF, Baker J, Corbisiero R, et al. Impact of MultipointTM pacing (MPP) programming on clinical outcomes with a quadripolar CRT-D system in the MPP IDE study. *Heart rhythm*. Conference: 38th annual scientific sessions of the heart rhythm society, heart rhythm 2017. United states. 2017;14(5 Supplement 1):S38. PMID: CN-01400211. – **Not full report**
1634. Tomczak CR, Paterson I, Haykowsky MJ, et al. Cardiac resynchronization therapy modulation of exercise left ventricular function and pulmonary O₂ uptake in heart failure. *Am J Physiol Heart Circ Physiol*. 2012 Jun 15;302(12):H2635-45 - **Not relevant to Key Questions**
1635. Tompkins C, McLean R, Cheng A, et al. End-stage renal disease predicts complications in pacemaker and ICD implants. *J Cardiovasc Electrophysiol*. 2011 Oct;22(10):1099-104. - **Population inclusion criteria do**

- not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1636. Tompkins CM, Kutiyifa V, Arshad A, et al. Sex Differences in Device Therapies for Ventricular Arrhythmias or Death in the Multicenter Automatic Defibrillator Implantation Trial With Cardiac Resynchronization Therapy (MADIT-CRT) Trial. *J Cardiovasc Electrophysiol*. 2015 Aug;26(8):862-71. doi: 10.1111/jce.12701. PMID: 25929699. - **Does not address outcome of interest**
1637. Toner L, Flannery D, Sugumar H, et al. Electrical remodelling and response following cardiac resynchronization therapy: A novel analysis of intracardiac electrogram using a quadripolar lead. *J Arrhythm*. 2018 Jun;34(3):274-80. doi: 10.1002/joa3.12063. PMID: 29951143. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1638. Topaz G, Haim M, Kusniec J, et al. Association between Red Cell Distribution Width and Mortality after Cardiac Resynchronization Therapy. *Isr Med Assoc J*. 2015 Aug;17(8):505-9. PMID: 26394494. - **Addresses only effectiveness, not an RCT**
1639. Tournoux F, Chequer R, Sroussi M, et al. Value of mechanical dyssynchrony as assessed by radionuclide ventriculography to predict the cardiac resynchronization therapy response. *Eur Heart J Cardiovasc Imaging*. 2016 Nov;17(11):1250-8. doi: 10.1093/ehjci/jev286. PMID: 26613747. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1640. Tournoux F, Singh JP, Chan RC, et al. Absence of left ventricular apical rocking and atrial-ventricular dyssynchrony predicts non-response to cardiac resynchronization therapy. *Eur Heart J Cardiovasc Imaging*. 2012 Jan;13(1):86-94 - **Not relevant to Key Questions**
1641. Toussaint JF, Lavergne T, Kerrou K, et al. Basal asynchrony and resynchronization with biventricular pacing predict long-term improvement of LV function in heart failure patients. *Pacing Clin Electrophysiol*. 2003 Sep;26(9):1815-23. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1642. Trolese L, Biermann J, Hartmann M, et al. Haemodynamic vector personalization of a quadripolar left ventricular lead used for cardiac resynchronization therapy: use of surface electrocardiogram and interventricular time delays. *Europace*. 2014 Oct;16(10):1476-81. doi: 10.1093/europace/euu136. PMID: 24895019. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1643. Trucco E, Tolosana JM, Arbelo E, et al. Improvement of Reverse Remodeling Using Electrocardiogram Fusion-Optimized Intervals in Cardiac Resynchronization Therapy: A Randomized Study. *JACC Clin*

- Electrophysiol. 2018 Feb;4(2):181-9. doi: 10.1016/j.jacep.2017.11.020. PMID: 29749935. - **Addresses only effectiveness, not an RCT**
1644. Trucco E, Tolosana JM, Castel MA, et al. Plasma tissue inhibitor of matrix metalloproteinase-1 a predictor of long-term mortality in patients treated with cardiac resynchronization therapy. *Europace*. 2016 Feb;18(2):232-7. doi: 10.1093/europace/euv054. PMID: 25883077. - **Does not address outcome of interest**
1645. Trucco ME, Arbelo E, Tolosana JM, et al. Midterm response to cardiac resynchronization, using ECG fusion optimized intervals: a randomized study. *Heart rhythm*. 2015;12(5 SUPPL. 1):S217. PMID: CN-01089004. – **Not full report**
1646. Trucco ME, Tolosana JM, Arbelo E, et al. Improvement of reverse remodelling by using ECG fusion optimized intervals (FOI) in cardiac resynchronization therapy: a randomized study. *Europace*. Conference: european heart rhythm association EUROPACE-CARDIOSTIM 2017 congress. Austria. 2017;19(Supplement 3):iii323. PMID: CN-01421503. – **Not full report**
1647. Trucco ME, Tolosana JM, Arbelo E, et al. Improvement of reverse remodeling by using ECG Fusion Optimized Intervals (FOI) in cardiac resynchronisation therapy: a randomised study. *European heart journal*. Conference: european society of cardiology, ESC congress 2017. Spain. 2017;38(Supplement 1):1164. doi: 10.1093/eurheartj/ehx502.P5467. PMID: CN-01468743. – **Not full report**
1648. Trucco ME, Tolosana JM, Arbelo E, et al. Improvement of reverse remodeling by using ECG fusion optimized intervals (FOI) in cardiac resynchronization therapy: a randomized study. *Heart rhythm*. Conference: 38th annual scientific sessions of the heart rhythm society, heart rhythm 2017. United states. 2017;14(5 Supplement 1):S401. PMID: CN-01400241. – **Not full report**
1649. Truong QA, Januzzi JL, Szymonifka J, et al. Coronary sinus biomarker sampling compared to peripheral venous blood for predicting outcomes in patients with severe heart failure undergoing cardiac resynchronization therapy: the BIOCRT study. *Heart Rhythm*. 2014 Dec;11(12):2167-75. doi: 10.1016/j.hrthm.2014.07.007. PMID: 25014756 - **Not relevant to Key Questions**
1650. Truong QA, Januzzi JL, Szymonifka J, et al. Coronary sinus biomarker sampling compared to peripheral venous blood for predicting outcomes in patients with severe heart failure undergoing cardiac resynchronization therapy: the BIOCRT study. *Heart Rhythm*. 2014 Dec;11(12):2167-75. doi: 10.1016/j.hrthm.2014.07.007. PMID: 25014756. - **Addresses only effectiveness, not an RCT**
1651. Truong QA, Szymonifka J, Januzzi JL, et al. Cardiorenal status using amino-terminal pro-brain natriuretic peptide and

- cystatin C on cardiac resynchronization therapy outcomes: From the BIOCRT Study. *Heart Rhythm*. 2019 Jun;16(6):928-35. doi: 10.1016/j.hrthm.2018.12.023. PMID: 30590191. - **Addresses effectiveness questions only and is not RCT**
1652. Truong QA, Szymonifka J, Picard MH, et al. Utility of dual-source computed tomography in cardiac resynchronization therapy-DIRECT study. *Heart Rhythm*. 2018 Aug;15(8):1206-13. doi: 10.1016/j.hrthm.2018.03.020. PMID: 29572087. - **Addresses only effectiveness, not an RCT**
1653. Tsai SC, Chang YC, Chiang KF, et al. LV Dyssynchrony Is Helpful in Predicting Ventricular Arrhythmia in Ischemic Cardiomyopathy After Cardiac Resynchronization Therapy: A Preliminary Study. *Medicine (Baltimore)*. 2016 Feb;95(7):e2840. doi: 10.1097/md.0000000000002840. PMID: 26886645. - **Does not address outcome of interest**
1654. Tse HF, Siu CW, Lee KL, et al. The incremental benefit of rate-adaptive pacing on exercise performance during cardiac resynchronization therapy. *J Am Coll Cardiol*. 2005 Dec 20;46(12):2292-7 - **Not relevant to Key Questions**
1655. Turner MS, Bleasdale RA, Vinereanu D, et al. Electrical and mechanical components of dyssynchrony in heart failure patients with normal QRS duration and left bundle-branch block: impact of left and biventricular pacing. *Circulation*. 2004 Jun 1;109(21):2544-9. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1656. Uebleis C, Hellweger S, Laubender RP, et al. Left ventricular dyssynchrony assessed by gated SPECT phase analysis is an independent predictor of death in patients with advanced coronary artery disease and reduced left ventricular function not undergoing cardiac resynchronization therapy. *Eur. J. Nucl. Med. Mol. Imaging*. 2012 2012;39(10):1561-9. - **Does not evaluate a CRT**
1657. Umar F, Taylor RJ, Stegemann B, et al. Haemodynamic effects of cardiac resynchronization therapy using single-vein, three-pole, multipoint left ventricular pacing in patients with ischaemic cardiomyopathy and a left ventricular free wall scar: the MAESTRO study. *Europace*. 2016 Aug;18(8):1227-34. doi: 10.1093/europace/euv396. PMID: 26718535. - **Does not address outcome of interest**
1658. Umar S, Bax JJ, Klok M, et al. Myocardial collagen metabolism in failing hearts before and during cardiac resynchronization therapy. *Eur J Heart Fail*. 2008 Sep;10(9):878-83.-**Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**

1659. Upadhyay GA, Chatterjee NA, Kandala J, et al. Assessing mitral regurgitation in the prediction of clinical outcome after cardiac resynchronization therapy. *Heart Rhythm*. 2015 Jun;12(6):1201-8. doi: 10.1016/j.hrthm.2015.02.022. PMID: 25708879. - **Addresses only effectiveness, not an RCT**
1660. Upadhyay GA, Vijayaraman P, Nayak HM, et al. On-treatment comparison between corrective his bundle pacing and biventricular pacing for cardiac resynchronization: A secondary analysis of his-sync. *Heart Rhythm*. 2019 May 13doi: 10.1016/j.hrthm.2019.05.009. PMID: 31096064. - **Does not address outcome of interest**
1661. Urbanek B, Chudzik M, Piestrzeniewicz K, et al. Whether two steps optimization in resynchronization therapy can decrease the number of non-responders: 1 year randomized study results. *European heart journal*. 2013;34:584. PMID: CN-01023900. – **Not full report**
1662. Urbanek B, Kaczmarek K, Klimczak A, et al. Potential benefit of optimizing atrioventricular & interventricular delays in patients with cardiac resynchronization therapy. *Indian J Med Res*. 2017 Jul;146(1):71-7. doi: 10.4103/ijmr.IJMR_1560_14. PMID: 29168462. - **Addresses only effectiveness, not an RCT**
1663. Urbanek B, Ruta J, Kudrynski K, et al. Relationship Between Changes in Pulse Pressure and Frequency Domain Components of Heart Rate Variability During Short-Term Left Ventricular Pacing in Patients with Cardiac Resynchronization Therapy. *Med Sci Monit*. 2016 Jun 15;22:2043-9. PMID: 27305349. - **Addresses only effectiveness, not an RCT**
1664. Uretsky BF, Thygesen K, Daubert JC, et al. Predictors of mortality from pump failure and sudden cardiac death in patients with systolic heart failure and left ventricular dyssynchrony: results of the CARE-HF trial. *J Card Fail*. 2008 2008 Oct;14(8):670-5 - **Not relevant to Key Questions**
1665. Vaillant C, Martins RP, Donal E, et al. Resolution of left bundle branch block-induced cardiomyopathy by cardiac resynchronization therapy. *J Am Coll Cardiol*. 2013 2013 Mar 12;61(10):1089-95 - **Not relevant to Key Questions**
1666. Vaillant C, Martins RP, Donal E, et al. Resolution of left bundle branch block-induced cardiomyopathy by cardiac resynchronization therapy. *J Am Coll Cardiol*. 2013;61(10):1089-95. doi: 10.1016/j.jacc.2012.10.053. PMID: 23352778. - **Addresses only effectiveness, not an RCT**
1667. Valls-Bertault V, Fatemi M, Gilard M, et al. Assessment of upgrading to biventricular pacing in patients with right ventricular pacing and congestive heart failure after atrioventricular junctional ablation for chronic atrial fibrillation. *Europace*. 2004 2004 Sep;6(5):438-43 - **Not relevant to Key Questions**
1668. Valzania C, Biffi M, Bonfiglioli R, et al. Effects of cardiac

- resynchronization therapy on right ventricular function during rest and exercise, as assessed by radionuclide angiography, and on NT-proBNP levels. *J Nucl Cardiol.* 2017 Jun 30doi: 10.1007/s12350-017-0971-3. PMID: 28667454. - **Does not address outcome of interest**
1669. Valzania C, Gadler F, Boriani G, et al. Changes in global longitudinal strain during rest and exercise in patients treated with cardiac resynchronization therapy. *Clin Physiol Funct Imaging.* 2012 2012 Jul;32(4):310-6 - **Not relevant to Key Questions**
1670. Vamos M, Erath JW, Bari Z, et al. Effects of Upgrade Versus De Novo Cardiac Resynchronization Therapy on Clinical Response and Long-Term Survival: Results from a Multicenter Study. *Circ Arrhythm Electrophysiol.* 2017 Feb;10(2):e004471. doi: 10.1161/circep.116.004471. PMID: 28202628. - **Addresses only effectiveness, not an RCT**
1671. Vamos M, Nyolczas N, Bari Z, et al. Refined heart failure detection algorithm for improved clinical reliability of OptiVol alerts in CRT-D recipients. *Cardiol J.* 2018;25(2):236-44. doi: 10.5603/CJ.a2017.0077. PMID: 28653309. - **Does not address outcome of interest**
1672. van Bommel RJ, Borleffs CJ, Ypenburg C, et al. Morbidity and mortality in heart failure patients treated with cardiac resynchronization therapy: influence of pre-implantation characteristics on long-term outcome. *Eur Heart J.* 2010 2010 Nov;31(22):2783-90. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1673. van Bommel RJ, Gorcsan Jr, Chung ES, et al. Effects of cardiac resynchronisation therapy in patients with heart failure having a narrow QRS Complex enrolled in PROSPECT. *Heart.* 2010 2010 Jul;96(14):1107-13. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1674. van Bommel RJ, van Rijnsoever E, Borleffs CJ, et al. Effect of cardiac resynchronization therapy in patients with New York Heart Association functional class IV heart failure. *Am J Cardiol.* 2010 2010 Oct 15;106(8):1146-51.- **Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
1675. van Campen CM, Visser FC, van der Weerd AP, et al. FDG PET as a predictor of response to resynchronisation therapy in patients with ischaemic cardiomyopathy. *Eur J Nucl Med Mol Imaging.* 2007 2007 Mar;34(3):309-15. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1676. Van de Veire NR, Bleeker GB, De Sutter J, et al. Tissue synchronisation imaging accurately measures left ventricular dyssynchrony and predicts response to cardiac

- resynchronisation therapy. *Heart*. 2007 2007 Sep;93(9):1034-9. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1677. van der Bijl P, Khidir M, Ajmone Marsan N, et al. Effect of Functional Mitral Regurgitation on Outcome in Patients Receiving Cardiac Resynchronization Therapy for Heart Failure. *American Journal of Cardiology*. 2019;123(1):75-83. doi: 10.1016/j.amjcard.2018.09.020. - **Other: No comparison of interest**
1678. van der Bijl P, Khidir M, Ajmone Marsan N, et al. Effect of Functional Mitral Regurgitation on Outcome in Patients Receiving Cardiac Resynchronization Therapy for Heart Failure. *American Journal of Cardiology*. 2019;123(1):75-83. doi: 10.1016/j.amjcard.2018.09.020. - **Other: No comparison of interest**
1679. van der Bijl P, Khidir M, Leung M, et al. Impact of QRS complex duration and morphology on left ventricular reverse remodelling and left ventricular function improvement after cardiac resynchronization therapy. *Eur J Heart Fail*. 2017 Sep;19(9):1145-51. doi: 10.1002/ejhf.769. PMID: 28176418. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1680. van der Bijl P, Khidir MJH, Leung M, et al. Reduced left ventricular mechanical dispersion at 6 months follow-up after cardiac resynchronization therapy is associated with superior long-term outcome. *Heart Rhythm*. 2018 May 9doi: 10.1016/j.hrthm.2018.05.005. PMID: 29753023. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1681. van der Bijl P, Vo NM, Leung M, et al. Impact of atrial fibrillation on improvement of functional mitral regurgitation in cardiac resynchronization therapy. *Heart Rhythm*. 2018 Jul 12doi: 10.1016/j.hrthm.2018.07.012. PMID: 30017815. - **Does not address outcome of interest**
1682. van der Heijden AC, Hoke U, Thijssen J, et al. Long-Term Echocardiographic Outcome in Super-Responders to Cardiac Resynchronization Therapy and the Association With Mortality and Defibrillator Therapy. *Am J Cardiol*. 2016 Oct 15;118(8):1217-24. doi: 10.1016/j.amjcard.2016.07.041. PMID: 27586169. - **Does not address outcome of interest**
1683. van der Heijden AC, Hoke U, Thijssen J, et al. Super-responders to cardiac resynchronization therapy remain at risk for ventricular arrhythmias and benefit from defibrillator treatment. *Eur J Heart Fail*. 2014 Oct;16(10):1104-11. doi: 10.1002/ejhf.152. PMID: 25138313. - **Does not address outcome of interest**
1684. Van Der Heijden AC, Levy WC, L VANE, et al. Prognostic Impact of Implementation of QRS Characteristics in the Seattle Heart Failure Model in ICD and

- CRT-D Recipients. *Pacing Clin Electrophysiol.* 2016 Jun;39(6):565-73. doi: 10.1111/pace.12862. PMID: 27027982. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1685. Van Deursen CJM, Vernooij K, Dudink E, et al. Vectorcardiographic QRS area as a novel predictor of response to cardiac resynchronization therapy. *J Electrocardiol.* 2015;48(1):45-52. doi: 10.1016/j.jelectrocard.2014.10.003. - **Addresses only effectiveness, not an RCT**
1686. van Dijk VF, Fanggiday J, Balt JC, et al. Effects of epicardial versus transvenous left ventricular lead placement on left ventricular function and cardiac perfusion in cardiac resynchronization therapy: A randomized clinical trial. *J Cardiovasc Electrophysiol.* 2017;28(8):917-23. doi: 10.1111/jce.13242. - **Does not address outcome of interest**
1687. van Eck JW, van Hemel NM, Zuithof P, et al. Incidence and predictors of in-hospital events after first implantation of pacemakers. *Europace.* 2007 2007 Oct;9(10):884-9. - **Does not evaluate a CRT**
1688. van Eck JW, van Hemel NM, Zuithof P, et al. Incidence and predictors of in-hospital events after first implantation of pacemakers. *Europace.* 2007 2007 Oct;9(10):884-9. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1689. van Everdingen WM, Walmsley J, Cramer MJ, et al. Echocardiographic Prediction of Cardiac Resynchronization Therapy Response Requires Analysis of Both Mechanical Dyssynchrony and Right Ventricular Function: A Combined Analysis of Patient Data and Computer Simulations. *J Am Soc Echocardiogr.* 2017 Oct;30(10):1012-20 e2. doi: 10.1016/j.echo.2017.06.004. PMID: 28801203. - **Addresses only effectiveness, not an RCT**
1690. van Everdingen WM, Zweerink A, Salden OAE, et al. Atrioventricular optimization in cardiac resynchronization therapy with quadripolar leads: should we optimize every pacing configuration including multipoint pacing? *Europace.* 2018 Jul 24doi: 10.1093/europace/euy138. PMID: 30052906. - **Does not address outcome of interest**
1691. van Everdingen WM, Zweerink A, Salden OAE, et al. Pressure-Volume Loop Analysis of Multipoint Pacing With a Quadripolar Left Ventricular Lead in Cardiac Resynchronization Therapy. *JACC Clin Electrophysiol.* 2018 Jul;4(7):881-9. doi: 10.1016/j.jacep.2018.02.005. PMID: 30025687. - **Does not address outcome of interest**
1692. van Gelder IC, Phan HM, Wilkoff BL, et al. Prognostic significance of atrial arrhythmias in a primary prevention ICD population. *Pacing Clin Electrophysiol.* 2011 2011 Sep;34(9):1070-9 - **Not relevant to Key Questions**

1693. van Geldorp IE, Vernooy K, Delhaas T, et al. Beneficial effects of biventricular pacing in chronically right ventricular paced patients with mild cardiomyopathy. *Europace*. 2010 Feb;12(2):223-9 - **Not relevant to Key Questions**
1694. van Stipdonk AMW, Ter Horst I, Kloosterman M, et al. QRS Area Is a Strong Determinant of Outcome in Cardiac Resynchronization Therapy. *Circ Arrhythm Electrophysiol*. 2018;11(12):e006497. doi: 10.1161/circep.118.006497. - **Other: predictors**
1695. van 't Sant J, Fiolet AT, ter Horst IA, et al. Volumetric Response beyond Six Months of Cardiac Resynchronization Therapy and Clinical Outcome. *PLoS One*. 2015;10(5):e0124323. doi: 10.1371/journal.pone.0124323. PMID: 25933068. - **Addresses only effectiveness, not an RCT**
1696. van 't Sant J, Mast TP, Bos MM, et al. Echo response and clinical outcome in CRT patients. *Neth Heart J*. 2016 Jan;24(1):47-55. doi: 10.1007/s12471-015-0767-5. PMID: 26643303. - **Addresses only effectiveness, not an RCT**
1697. Vandenberg B, Garweg C, Voros G, et al. Changes in Implantation Patterns and Therapy Rates of Implantable Cardioverter Defibrillators over Time in Ischemic and Dilated Cardiomyopathy Patients. *Pacing Clin Electrophysiol*. 2016 Aug;39(8):848-57. doi: 10.1111/pace.12891. PMID: 27198580. - **Does not evaluate a CRT**
1698. Vanderheyden M, Mullens W, Delrue L, et al. Myocardial gene expression in heart failure patients treated with cardiac resynchronization therapy responders versus nonresponders. *J Am Coll Cardiol*. 2008 2008 Jan 15;51(2):129-36.-**Other: Not relevant to key questions**
1699. Vanderheyden M, Wellens F, Bartunek J, et al. Cardiac resynchronization therapy delays heart transplantation in patients with end-stage heart failure and mechanical dyssynchrony. *J Heart Lung Transplant*. 2006 2006 Apr;25(4):447-53. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1700. Van't Sant J, Ter Horst IA, Wijers SC, et al. Measurements of electrical and mechanical dyssynchrony are both essential to improve prediction of CRT response. *J Electrocardiol*. 2015 Jul-Aug;48(4):601-8. doi: 10.1016/j.jelectrocard.2015.01.015. PMID: 25754584. - **Does not address outcome of interest**
1701. Varma C, O'Callaghan P, Rowland E, et al. Comparison between biventricular pacing and single site pacing in patients with poor ventricular function: a hemodynamic study. *Pacing Clin Electrophysiol*. 2003 2003 Feb;26(2 Pt 1):551-8 - **Not relevant to Key Questions**
1702. Varma N, Baker J, Corbisiero R, et al. Impact of cardiomyopathy etiology and implant classification on CRT response with a quadripolar CRT-D system in the MultipointTM pacing (MPP) IDE

- study: MPP VS. Biventricular pacing. Heart rhythm. Conference: 38th annual scientific sessions of the heart rhythm society, heart rhythm 2017. United states. 2017;14(5 Supplement 1):S36-S7. PMID: CN-01400219. – **Not full report**
1703. Varma N, Jia P, Rudy Y. Electrocardiographic imaging of patients with heart failure with left bundle branch block and response to cardiac resynchronization therapy. J Electrocardiol. 2007 Nov-Dec;40(6 Suppl):S174-8. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1704. Varma N, Lappe J, He J, et al. Sex-Specific Response to Cardiac Resynchronization Therapy: Effect of Left Ventricular Size and QRS Duration in Left Bundle Branch Block. JACC Clin Electrophysiol. 2017 Aug;3(8):844-53. doi: 10.1016/j.jacep.2017.02.021. PMID: 29759781. - **Other: not RCT-address gender**
1705. Varma N, Manne M, Nguyen D, et al. Probability and magnitude of response to cardiac resynchronization therapy according to QRS duration and gender in nonischemic cardiomyopathy and LBBB. Heart Rhythm. 2014 Jul;11(7):1139-47. doi: 10.1016/j.hrthm.2014.04.001. PMID: 24704570 - **Not relevant to Key Questions**
1706. Varma N, Manne M, Nguyen D, et al. Probability and magnitude of response to cardiac resynchronization therapy according to QRS duration and gender in nonischemic cardiomyopathy and LBBB. Heart Rhythm. 2014 Jul;11(7):1139-47. doi: 10.1016/j.hrthm.2014.04.001. PMID: 24704570. - **Does not address outcome of interest**
1707. Varma N, Manne M, Nguyen D, et al. Probability and magnitude of response to cardiac resynchronization therapy according to QRS duration and gender in nonischemic cardiomyopathy and LBBB. Heart Rhythm. 2014 Jul;11(7):1139-47. doi: 10.1016/j.hrthm.2014.04.001. PMID: 24704570. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1708. Varma N, O'Donnell D, Bassiouny M, et al. Programming Cardiac Resynchronization Therapy for Electrical Synchrony: Reaching Beyond Left Bundle Branch Block and Left Ventricular Activation Delay. J Am Heart Assoc. 2018 Feb 6;7(3)doi: 10.1161/jaha.117.007489. PMID: 29432133. - **Addresses only effectiveness, not an RCT**
1709. Varma N, Schaerf R, Kalbfleisch S, et al. Defibrillation thresholds with right pectoral implantable cardioverter defibrillators and impact of waveform tuning (the Tilt and Tune trial). Europace. 2017 Nov 1;19(11):1810-7. doi: 10.1093/europace/euw306. PMID: 27986795. - **Does not address outcome of interest**
1710. Varma N, Sogaard P, Bax JJ, et al. Interaction of Left Ventricular Size and Sex on Outcome of

- Cardiac Resynchronization Therapy Among Patients With a Narrow QRS Duration in the EchoCRT Trial. *J Am Heart Assoc.* 2018 May 27;7(11)doi: 10.1161/jaha.118.009592. PMID: 29807890. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1711. Varma N, Stadler RW, Ghosh S, et al. Influence of automatic frequent pace-timing adjustments on effective left ventricular pacing during cardiac resynchronization therapy. *Europace.* 2017 May 1;19(5):831-7. doi: 10.1093/europace/euw108. PMID: 27230561. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1712. Varma N. Left ventricular electrical activation during right ventricular pacing in heart failure patients with LBBB: visualization by electrocardiographic imaging and implications for cardiac resynchronization therapy. *J Electrocardiol.* 2015 Jan-Feb;48(1):53-61. doi: 10.1016/j.jelectrocard.2014.09.002. PMID: 25301520 - **Not relevant to Key Questions**
1713. Vatankulu MA, Goktekin O, Kaya MG, et al. Effect of long-term resynchronization therapy on left ventricular remodeling in pacemaker patients upgraded to biventricular devices. *Am J Cardiol.* 2009 2009 May 1;103(9):1280-4 - **Not relevant to Key Questions**
1714. Vecera J, Penicka M, Eriksen M, et al. Wasted septal work in left ventricular dyssynchrony: a novel principle to predict response to cardiac resynchronization therapy. *Eur Heart J Cardiovasc Imaging.* 2016 Jun;17(6):624-32. doi: 10.1093/ehjci/jew019. PMID: 26921169. - **Does not address outcome of interest**
1715. Vegh EM, Engels EB, van Deursen CJ, et al. T-wave area as biomarker of clinical response to cardiac resynchronization therapy. *Europace.* 2016 Jul;18(7):1077-85. doi: 10.1093/europace/euv259. PMID: 26462704. - **Addresses only effectiveness, not an RCT**
1716. Vegh EM, Kandala J, Januszkiewicz L, et al. A new simplified electrocardiographic score predicts clinical outcome in patients treated with CRT. *Europace.* 2018 Mar 1;20(3):492-500. doi: 10.1093/europace/euw382. PMID: 28160485. - **Addresses only effectiveness, not an RCT**
1717. Vegh EM, Kandala J, Orencole M, et al. Device-Measured Physical Activity Versus Six-Minute Walk Test as a Predictor of Reverse Remodeling and Outcome After Cardiac Resynchronization Therapy for Heart Failure. *Am J Cardiol.* 2014 2014 Feb 12 - **Not relevant to Key Questions**
1718. Vegh EM, Kandala J, Orencole M, et al. Device-Measured Physical Activity Versus Six-Minute Walk Test as a Predictor of Reverse Remodeling and Outcome After Cardiac Resynchronization Therapy for Heart Failure. *Am J Cardiol.*

- 2014 Feb 12. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1719. Venkataraman G, Moore H, Karasik P, et al. Biventricular implantable cardioverter defibrillator right ventricle pace-sense ring electrode failure: lead switch fix. *Pacing Clin Electrophysiol.* 2008 2008 Jul;31(7):899-903. - **Other: <30 patients; not rct**
1720. Venkateswaran RV, Freeman C, Chatterjee N, et al. Anemia and its association with clinical outcome in heart failure patients undergoing cardiac resynchronization therapy. *J Interv Card Electrophysiol.* 2015 Dec;44(3):297-304. doi: 10.1007/s10840-015-0062-9. PMID: 26453528. - **Addresses only effectiveness, not an RCT**
1721. Vera Marinho V, Milner J, Alves P, et al. Effectiveness of cardiac resynchronization therapy in heart failure patients with valvular heart disease: comparison with patients with dilated cardiomyopathy. *European journal of heart failure.* Conference: heart failure 2018 and the 5th world congress on acute heart failure. Austria. 2018;20(Supplement 1):449-50. doi: 10.1002/ejhf.1197. PMID: CN-01613176. - **Does not address outcome of interest**
1722. Verbrugge FH, Dupont M, Vercammen J, et al. Time from emerging heart failure symptoms to cardiac resynchronisation therapy: impact on clinical response. *Heart.* 2013 2013 Mar;99(5):314-9. - **Addresses only effectiveness, not an RCT**
1723. Verbrugge FH, Dupont M, Vercammen J, et al. Time from emerging heart failure symptoms to cardiac resynchronisation therapy: Impact on clinical response. *Heart.* 2013;99(5):314-9. doi: 10.1136/heartjnl-2012-302807. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1724. Verbrugge FH, Nijst P, Van Herendael H, et al. Asymptomatic episodes of device-registered atrial tachyarrhythmia are not associated with worse cardiac resynchronization therapy response. *Europace.* 2014 Aug;16(8):1197-204. doi: 10.1093/europace/eut434. PMID: 24489074. - **Addresses only effectiveness, not an RCT**
1725. Verbrugge FH, Verhaert D, Grieten L, et al. Revisiting diastolic filling time as mechanistic insight for response to cardiac resynchronization therapy. *Europace.* 2013;15(12):1747-56. doi: 10.1093/europace/eut130. - **Does not address outcome of interest**
1726. Vereckei A, Szelenyi Z, Kutya V, et al. Novel electrocardiographic dyssynchrony criteria improve patient selection for cardiac resynchronization therapy. *Europace.* 2018 Jan 1;20(1):97-103. doi: 10.1093/europace/euw326. PMID: 28011802. - **Addresses only effectiveness, not an RCT**

1727. Verhaert D, Popovic ZB, De S, et al. Impact of mitral regurgitation on reverse remodeling and outcome in patients undergoing cardiac resynchronization therapy. *Circ Cardiovasc Imaging*. 2012 2012 Jan;5(1):21-6 - **Not relevant to Key Questions**
1728. Verhagen MP, van Boven N, Ruiter JH, et al. Follow-up of implantable cardioverter-defibrillator therapy: comparison of coronary artery disease and dilated cardiomyopathy. *Neth Heart J*. 2014 Oct;22(10):431-7. doi: 10.1007/s12471-014-0595-z. PMID: 25169578. - **Does not evaluate a CRT**
1729. Verhagen MP, van Boven N, Ruiter JH, et al. Follow-up of implantable cardioverter-defibrillator therapy: comparison of coronary artery disease and dilated cardiomyopathy. *Neth Heart J*. 2014 Oct;22(10):431-7. doi: 10.1007/s12471-014-0595-z. PMID: 25169578 - **Not relevant to Key Questions**
1730. Verna E, Ghiringhelli S, Scotti S, et al. Evaluation of baseline contractile reserve vs dyssynchrony as a predictor of functional improvement and long term outcome after resynchronization pacing therapy: a radionuclide stress study. *J Nucl Cardiol*. 2012 2012 Feb;19(1):53-62 - **Not relevant to Key Questions**
1731. Verna E, Ghiringhelli S, Scotti S, et al. Evaluation of baseline contractile reserve vs dyssynchrony as a predictor of functional improvement and long term outcome after resynchronization pacing therapy: a radionuclide stress study. *J Nucl Cardiol*. 2012 2012 Feb;19(1):53-62. - **Addresses only effectiveness, not an RCT**
1732. Versteeg H, Denollet J, Meine M, et al. Patient-reported health status prior to cardiac resynchronisation therapy identifies patients at risk for poor survival and prolonged hospital stays. *Neth Heart J*. 2016 Jan;24(1):18-24. doi: 10.1007/s12471-015-0775-5. PMID: 26645709. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1733. Versteeg H, Van't Sant J, Cramer MJ, et al. Discrepancy between echocardiographic and patient-reported health status response to cardiac resynchronization therapy: Results of the PSYHEART-CRT study. *Eur J Heart Fail*. 2014;16(2):227-34. doi: 10.1002/ejhf.38. - **Does not address outcome of interest**
1734. Vidal B, Delgado V, Mont L, et al. Decreased likelihood of response to cardiac resynchronization in patients with severe heart failure. *Eur J Heart Fail*. 2010 2010 Mar;12(3):283-7 - **Not relevant to Key Questions**
1735. Vidal B, Sitges M, Marigliano A, et al. Relation of response to cardiac resynchronization therapy to left ventricular reverse remodeling. *Am J Cardiol*. 2006 2006 Mar 15;97(6):876-81 - **Not relevant to Key Questions**
1736. Vidula H, Kuttyifa V, McNitt S, et al. Long-Term Survival of Patients With Left Bundle Branch

- Block Who Are Hypo-Responders to Cardiac Resynchronization Therapy. *Am J Cardiol.* 2017 Sep 1;120(5):825-30. doi: 10.1016/j.amjcard.2017.06.001. PMID: 28688704. - **Does not address outcome of interest**
1737. Vijayaraman P, Herweg B, Ellenbogen KA, et al. His-Optimized Cardiac Resynchronization Therapy to Maximize Electrical Resynchronization. *Circ Arrhythm Electrophysiol.* 2019 Feb;12(2):e006934. doi: 10.1161/circep.118.006934. PMID: 30681348. - **Addresses effectiveness questions only and is not RCT**
1738. Vijayaraman P, Subzposh FA, Dandamudi G, et al. Permanent his bundle pacing reduces mortality/morbidity in pacemaker population compared to right ventricular pacing. *Heart rhythm. Conference: 38th annual scientific sessions of the heart rhythm society, heart rhythm 2017. United states.* 2017;14(5 Supplement 1):S64. PMID: CN-01400160. – **Not full report**
1739. Vijayaraman P, Subzposh FA, Naperkowski A, et al. His bundle pacing reduced mortality/morbidity compared to right ventricular pacing in pacemaker population: long-term follow-up. *Journal of interventional cardiac electrophysiology. Conference: 13th annual congress of the european cardiac arrhythmia society, ECAS 2017. Italy.* 2017;48:S28-S9. doi: 10.1007/s10840-017-0231-0. PMID: CN-01406576. – **Not full report**
1740. Villongco CT, Krummen DE, Omens JH, et al. Non-invasive, model-based measures of ventricular electrical dyssynchrony for predicting CRT outcomes. *Europace.* 2016 Dec;18(suppl 4):iv104-iv12. doi: 10.1093/europace/euw356. PMID: 28011837. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1741. Vinereanu D, Bleasdale R, Turner M, et al. Comparison of left ventricular-biventricular pacing on ventricular synchrony, mitral regurgitation, and global left ventricular function in patients with severe chronic heart failure. *Am J Cardiol.* 2004 2004 Aug 15;94(4):519-21 - **Not relevant to Key Questions**
1742. Vischer AS, Sticherling C, Kühne MS, et al. Role of defibrillation threshold testing in the contemporary defibrillator patient population. *J Cardiovasc Electrophysiol.* 2013;24(4):437-41. doi: 10.1111/jce.12042. - **Does not address outcome of interest**
1743. Vitarelli A, Franciosa P, Nguyen BL, et al. Additive value of right ventricular dyssynchrony indexes in predicting the success of cardiac resynchronization therapy: a speckle-tracking imaging study. *J Card Fail.* 2011 2011 May;17(5):392-402 - **Not relevant to Key Questions**
1744. Viveiros Monteiro A, Martins Oliveira M, Silva Cunha P, et al.

- Time to left ventricular reverse remodeling after cardiac resynchronization therapy: Better late than never. *Rev Port Cardiol.* 2016 Mar;35(3):161-7. doi: 10.1016/j.repc.2015.11.008. PMID: 26923367. - **Does not address outcome of interest**
1745. Vogt J, Heintze J, Lamp B, et al. Standard haemodynamic measurements. *Eur. Heart J. Suppl.* 2004 2004;6(D):D29-D34 - **Not relevant to Key Questions**
1746. Vogt J, Lamp B, Hansky B, et al. The Bad Oeynhausen experience. *Eur. Heart J. Suppl.* 2004 2004;6(D):D122-D7 - **Not relevant to Key Questions**
1747. Vogt J, Lamp B, Hansky B, et al. The Bad Oeynhausen experience. *Eur. Heart J. Suppl.* 2004 2004;6(D):D122-D7. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1748. Voigt A, Shalaby A, Adelstein E, et al. Beta-blocker utilization and outcomes in patients receiving cardiac resynchronization therapy. *Clin Cardiol.* 2010 2010 Jul;33(7):E1-5 - **Not relevant to Key Questions**
1749. Voigt A, Shalaby A, Adelstein E, et al. Beta-blocker utilization and outcomes in patients receiving cardiac resynchronization therapy. *Clin Cardiol.* 2010 2010 Jul;33(7):E1-5. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1750. von Scheidt W, Zugck C, Pauschinger M, et al. Characteristics, management modalities and outcome in chronic systolic heart failure patients treated in tertiary care centers: results from the EVIDence based TreAtment in Heart Failure (EVITA-HF) registry. *Clin Res Cardiol.* 2014 Dec;103(12):1006-14. doi: 10.1007/s00392-014-0743-x. PMID: 25052361. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1751. Vukajlovic D, Milasinovic G, Angelkov L, et al. Contractile reserve assessed by dobutamine test identifies super-responders to cardiac resynchronization therapy. *Arch Med Sci.* 2014 Aug 29;10(4):684-91. doi: 10.5114/aoms.2014.40790. PMID: 25276151. - **Does not address outcome of interest**
1752. Vural A, Agacdiken A, Celikyurt U, et al. Effect of cardiac resynchronization therapy on libido and erectile dysfunction. *Clin Cardiol.* 2011 2011 Jul;34(7):437-41 - **Not relevant to Key Questions**
1753. Vural A, Agacdiken A, Ural D, et al. Effect of cardiac resynchronization therapy on left atrial reverse remodeling and spontaneous echo contrast. *Tohoku J Exp Med.* 2004 2004 Feb;202(2):143-53 - **Not relevant to Key Questions**
1754. Waggoner AD, Faddis MN, Gleva MJ, et al. Cardiac resynchronization therapy acutely improves diastolic function. *J Am Soc Echocardiogr.* 2005 2005 Mar;18(3):216-20. - **Addresses only effectiveness, not an RCT**

1755. Waggoner AD, Faddis MN, Gleva MJ, et al. Improvements in left ventricular diastolic function after cardiac resynchronization therapy are coupled to response in systolic performance. *J Am Coll Cardiol*. 2005 Dec 20;46(12):2244-9 - **Not relevant to Key Questions**
1756. Wan D, Tan YT, Al-Lawati K, et al. Progression of heart failure after biventricular pacing: Is there a subgroup of "favorable nonresponders"? *Heart Rhythm*. 2015 Nov;12(11):2247-55. doi: 10.1016/j.hrthm.2015.06.015. PMID: 26066293. - **Does not address outcome of interest**
1757. Wang CL, Wu CT, Yeh YH, et al. Left bundle-branch block contraction patterns identified from radial-strain analysis predicts outcomes following cardiac resynchronization therapy. *Int J Cardiovasc Imaging*. 2017 Jun;33(6):869-77. doi: 10.1007/s10554-017-1083-5. PMID: 28150083. - **Does not address outcome of interest**
1758. Wang J, Su Y, Bai J, et al. Elevated pulmonary artery pressure predicts poor outcome after cardiac resynchronization therapy. *J Interv Card Electrophysiol*. 2014 Aug;40(2):171-8. doi: 10.1007/s10840-014-9890-2. PMID: 24728706 - **Not relevant to Key Questions**
1759. Wang J, Su Y, Bai J, et al. Elevated pulmonary artery pressure predicts poor outcome after cardiac resynchronization therapy. *J Interv Card Electrophysiol*. 2014 Aug;40(2):171-8. doi: 10.1007/s10840-014-9890-2. PMID: 24728706. - **Does not address outcome of interest**
1760. Wang J, Zhang P, Li X, et al. Presence of notched QRS on paced electrocardiographs as a predictor of poor response to cardiac resynchronization therapy. *Chin Med J (Engl)*. 2014;127(15):2727-34. PMID: 25146604. - **Addresses only effectiveness, not an RCT**
1761. Wang L, Yuan S, Borgquist R, et al. Coronary sinus cannulation with a steerable catheter during biventricular device implantation. *Scand Cardiovasc J*. 2014 Feb;48(1):41-6. doi: 10.3109/14017431.2013.875623. PMID: 24432887. - **Does not address outcome of interest**
1762. Wang NC, Hussain A, Adelstein EC, et al. Myocardial recovery after cardiac resynchronization therapy in left bundle branch block-associated idiopathic nonischemic cardiomyopathy: A NEOLITH II substudy. *Ann Noninvasive Electrocardiol*. 2018 Sep 28:e12603. doi: 10.1111/anec.12603. PMID: 30267454. - **Does not address outcome of interest**
1763. Wang NC, Hussain A, Adelstein EC, et al. Myocardial recovery after cardiac resynchronization therapy in left bundle branch block-associated idiopathic nonischemic cardiomyopathy: A NEOLITH II substudy. *Annals of Noninvasive Electrocardiology*. 2019;24(2)doi: 10.1111/anec.12603. - **Addresses effectiveness questions only and is not RCT**

1764. Wang NC, Li JZ, Adelstein EC, et al. New-onset left bundle branch block-associated idiopathic nonischemic cardiomyopathy and time from diagnosis to cardiac resynchronization therapy: The NEOLITH II study. *Pacing Clin Electrophysiol.* 2018 Feb;41(2):143-54. doi: 10.1111/pace.13264. PMID: 29314085. - **Addresses only effectiveness, not an RCT**
1765. Wang NC, Mezu-Chukwu U, Adelstein EC, et al. Sex-specific clinical outcomes after cardiac resynchronization therapy in left bundle branch block-associated idiopathic nonischemic cardiomyopathy: A NEOLITH II substudy. *Ann Noninvasive Electrocardiol.* 2019 Mar 27:e12641. doi: 10.1111/anec.12641. PMID: 30919524. - **Addresses effectiveness questions only and is not RCT**
1766. Wang NC, Singh M, Adelstein EC, et al. New-onset left bundle branch block-associated idiopathic nonischemic cardiomyopathy and left ventricular ejection fraction response to guideline-directed therapies: The NEOLITH study. *Heart Rhythm.* 2016 Apr;13(4):933-42. doi: 10.1016/j.hrthm.2015.12.020. PMID: 26688064. - **Does not address outcome of interest**
1767. Wang Q, Chen KY, Yu F, et al. Abnormal diastolic function underlies the different beneficial effects of cardiac resynchronization therapy on ischemic and non-ischemic cardiomyopathy. *Clinics (Sao Paulo).* 2017 Jul;72(7):432-7. doi: 10.6061/clinics/2017(07)08. PMID: 28793004. - **Does not address outcome of interest**
1768. Wang Y, Sharbaugh MS, Althouse AD, et al. Cardiac resynchronization therapy pacemakers versus defibrillators in older non-ischemic cardiomyopathy patients. *Indian Pacing Electrophysiol J.* 2018 Aug 16doi: 10.1016/j.ipej.2018.08.002. PMID: 30118798. - **Addresses only effectiveness, not an RCT**
1769. Wang Y, Sharbaugh MS, Althouse AD, et al. Cardiac resynchronization therapy pacemakers versus defibrillators in older non-ischemic cardiomyopathy patients. *Indian Pacing Electrophysiol J.* 2019;19(1):4-6. doi: 10.1016/j.ipej.2018.08.002. - **Addresses effectiveness questions only and is not RCT**
1770. Wang Y, Sharbaugh MS, Munir MB, et al. Gender Differences in Cardiac Resynchronization Therapy Device Choice and Outcome in Patients \geq 75 Years of Age with Heart Failure. *Am J Cardiol.* 2017 Dec 15;120(12):2201-6. doi: 10.1016/j.amjcard.2017.08.044. PMID: 29050686. - **Addresses only effectiveness, not an RCT**
1771. Warriner DR, Lawford P, Sheridan PJ. Cardiac Resynchronization Therapy Leads to Improvements in Handgrip Strength. *Cardiol Res.* 2016 Jun;7(3):95-103. doi: 10.14740/cr475w. PMID:

28197275. - **Does not address outcome of interest**
1772. Warriner DR, Lawford P, Sheridan PJ. Measures of endothelial dysfunction predict response to cardiac resynchronisation therapy. *Open Heart*. 2016;3(1):e000391. doi: 10.1136/openhrt-2015-000391. PMID: 27335654. - **Addresses only effectiveness, not an RCT**
1773. Wasmer K, Kobe J, Andresen D, et al. Comparing outcome of patients with coronary artery disease and dilated cardiomyopathy in ICD and CRT recipients: data from the German DEVICE-registry. *Clin Res Cardiol*. 2013 2013 Jul;102(7):513-21. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1774. Wasmer K, Köbe J, Andresen D, et al. Comparing outcome of patients with coronary artery disease and dilated cardiomyopathy in ICD and CRT recipients: Data from the German DEVICE - Registry. *Clinical Research in Cardiology*. 2013;102(7):513-21. doi: 10.1007/s00392-013-0559-0. - **Does not address outcome of interest**
1775. Wasserman K, Sun XG, Hansen JE. Effect of biventricular pacing on the exercise pathophysiology of heart failure. *Chest*. 2007 2007 Jul;132(1):250-61. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1776. Watanabe E, Kasai A, Fujii E, et al. Reliability of implantable cardioverter defibrillator home monitoring in forecasting the need for regular office visits, and patient perspective: Japanese HOME-ICD study. *Circ J*. 2013 2013;77(11):2704-11 - **Not relevant to Key Questions**
1777. Weber D, Koller M, Theuns D, et al. Predicting defibrillator benefit in patients with cardiac resynchronization therapy: A competing risk study. *Heart Rhythm*. 2019 Jan 31doi: 10.1016/j.hrthm.2019.01.033. PMID: 30710738. - **Addresses effectiveness questions only and is not RCT**
1778. Wei S, Loyo-Berrios NI, Haigney MC, et al. Elevated B-type natriuretic peptide is associated with increased in-hospital mortality or cardiac arrest in patients undergoing implantable cardioverter-defibrillator implantation. *Circ Cardiovasc Qual Outcomes*. 2011 2011 May;4(3):346-54 - **Not relevant to Key Questions**
1779. Wei S, Loyo-Berrios NI, Haigney MC, et al. Elevated B-type natriuretic peptide is associated with increased in-hospital mortality or cardiac arrest in patients undergoing implantable cardioverter-defibrillator implantation. *Circ Cardiovasc Qual Outcomes*. 2011 2011 May;4(3):346-54. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1780. Weigand S, Karl M, Brkic A, et al. The impact of multipole pacing

- on left ventricular function in patients with cardiac resynchronization therapy - A real-time three-dimensional echocardiography approach. *Int J Cardiol.* 2018 Dec 1;272:238-43. doi: 10.1016/j.ijcard.2018.08.033. PMID: 30121181. - **Does not address outcome of interest**
1781. Werling C, Weisse U, Siemon G, et al. Biventricular pacing in patients with ICD: how many patients are possible candidates? *Thorac Cardiovasc Surg.* 2002 Apr;50(2):67-70. - **Does not evaluate a CRT**
1782. Werling C, Weisse U, Siemon G, et al. Biventricular pacing in patients with ICD: how many patients are possible candidates? *Thorac Cardiovasc Surg.* 2002 Apr;50(2):67-70 - **Not relevant to Key Questions**
1783. Werys K, Petryka-Mazurkiewicz J, Blaszczyk L, et al. Cine dyscontractility index: A novel marker of mechanical dyssynchrony that predicts response to cardiac resynchronization therapy. *J Magn Reson Imaging.* 2016 Dec;44(6):1483-92. doi: 10.1002/jmri.25295. PMID: 27131044. - **Addresses only effectiveness, not an RCT**
1784. Whellan DJ, Sarkar S, Koehler J, et al. Development of a method to risk stratify patients with heart failure for 30-day readmission using implantable device diagnostics. *Am J Cardiol.* 2013 Jan 1;111(1):79-84 - **Not relevant to Key Questions**
1785. Whinnett ZI, Sohaib SMA, Mason M, et al. Multicenter Randomized Controlled Crossover Trial Comparing Hemodynamic Optimization Against Echocardiographic Optimization of AV and VV Delay of Cardiac Resynchronization Therapy: The BRAVO Trial. *JACC Cardiovasc Imaging.* 2018 May 11doi: 10.1016/j.jcmg.2018.02.014. PMID: 29778861. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1786. Wiesbauer F, Baytaroglu C, Azar D, et al. Echo Doppler parameters predict response to cardiac resynchronization therapy. *Eur J Clin Invest.* 2009 2009 Jan;39(1):1-10. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1787. Wieslander B, Loring Z, Zareba W, et al. Scar burden assessed by Selvester QRS score predicts prognosis, not CRT clinical benefit in preventing heart failure event and death: A MADIT-CRT sub-study. *J Electrocardiol.* 2016 Jul-Aug;49(4):603-9. doi: 10.1016/j.jelectrocard.2016.04.008. PMID: 27212144.-**Other: same patients included in the main study with 1820 subjects. - predictors**
1788. Wilinski J, Czarnecka D, Wojciechowska W, et al. Clinical and classic echocardiographic features of patients with, and without, left ventricle reverse remodeling following the introduction of cardiac resynchronization therapy.

- Cardiol J. 2011 2011;18(2):157-64. - **Addresses only effectiveness, not an RCT**
1789. Wilinski J, Czarnecka D, Wojciechowska W, et al. Different response rates to cardiac resynchronization therapy (CRT) according to the applied definition. *Przegl Lek.* 2009 2009;66(3):130-3. - **Addresses only effectiveness, not an RCT**
1790. Wilkoff BL, Richards M, Sharma A, et al. A Device Histogram-Based Simple Predictor of Mortality Risk in ICD and CRT-D Patients: The Heart Rate Score. *Pacing Clin Electrophysiol.* 2017 Apr;40(4):333-43. doi: 10.1111/pace.13036. PMID: 28156008. - **Does not address outcome of interest**
1791. Wilton SB, Exner DV, Healey JS, et al. Left Ventricular Lead Position and Outcomes in the Resynchronization-Defibrillation for Ambulatory Heart Failure Trial (RAFT). *Can J Cardiol.* 2013 2013 Oct 18 - **Not relevant to Key Questions**
1792. Wilton SB, Exner DV, Healey JS, et al. Left Ventricular Lead Position and Outcomes in the Resynchronization-Defibrillation for Ambulatory Heart Failure Trial (RAFT). *Canadian Journal of Cardiology.* 2014;30(4):413-9. doi: 10.1016/j.cjca.2013.10.009. - **Addresses only effectiveness, not an RCT**
1793. Wilton SB, Exner DV, Wyse DG, et al. Frequency and Outcomes of Postrandomization Atrial Tachyarrhythmias in the Resynchronization/Defibrillation in Ambulatory Heart Failure Trial. *Circ Arrhythm Electrophysiol.* 2016 May;9(5)doi: 10.1161/circep.115.003807. PMID: 27162033. - **Does not address outcome of interest**
1794. Winnik S, Elsener C, Seifert B, et al. "Real world" experience in Cardiac Resynchronization Therapy at a Swiss Tertiary Care Center. *Swiss Med Wkly.* 2017;147:w14425. doi: 10.4414/smw.2017.14425. PMID: 28421570. - **Addresses only effectiveness, not an RCT**
1795. Wita K, Mizia-Stec K, Plonska-Gosciniak E, et al. Low-dose dobutamine stress echo for reverse remodeling prediction after cardiac resynchronization. *Adv Med Sci.* 2015 Sep;60(2):294-9. doi: 10.1016/j.advms.2015.04.004. PMID: 26117588. - **Does not address outcome of interest**
1796. Witt CT, Kronborg MB, Nohr EA, et al. Adding the implantable cardioverter-defibrillator to cardiac resynchronization therapy is associated with improved long-term survival in ischaemic, but not in non-ischaemic cardiomyopathy. *Europace.* 2016 Mar;18(3):413-9. doi: 10.1093/europace/euv212. PMID: 26378089. - **Addresses only effectiveness, not an RCT**
1797. Witt CT, Kronborg MB, Nohr EA, et al. Left ventricular performance during triggered left ventricular pacing in patients with cardiac resynchronization therapy and left bundle branch block. *J Interv Card Electrophysiol.* 2016 Sep;46(3):345-51. doi:

- 10.1007/s10840-016-0155-0.
PMID: 27272650. - **Addresses only effectiveness, not an RCT**
1798. Witt CT, Kronborg MB, Nohr EA, et al. Optimization of heart failure medication after cardiac resynchronization therapy and the impact on long-term survival. *Eur Heart J Cardiovasc Pharmacother.* 2015 Jul;1(3):182-8. doi: 10.1093/ehjcvp/pvv016. PMID: 27533993. - **Does not address outcome of interest**
1799. Wo H-T, Chang P-C, Chen T-H, et al. Cardiac resynchronization therapy in patients with and without atrial fibrillation. *Acta Cardiol. Sin.* 2011 2011;27(1):46-51 - **Not relevant to Key Questions**
1800. Wojciechowska C, Tomasik A, Gała A, et al. Hemodynamic effects after six-month CRT and after acute discontinuation evaluated by RHC. *Experimental and Clinical Cardiology.* 2014;20(6):3932-52 - **Not relevant to Key Questions**
1801. Wollmann CG, Lawo T, Kühlkamp V, et al. Implantable defibrillators with enhanced detection algorithms: Detection performance and safety results from the painfree sst study. *PACE - Pacing and Clinical Electrophysiology.* 2014;37(9):1198-209. doi: 10.1111/pace.12390. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1802. Woo CY, Strandberg EJ, Schmiegelow MD, et al. Cost-Effectiveness of Adding Cardiac Resynchronization Therapy to an Implantable Cardioverter-Defibrillator Among Patients With Mild Heart Failure. *Ann Intern Med.* 2015 Sep 15;163(6):417-26. doi: 10.7326/m14-1804. PMID: 26301323. - **Does not address outcome of interest**
1803. Wu L, de Roest GJ, Hendriks ML, et al. The influence of right ventricular stimulation on acute response to cardiac resynchronisation therapy. *Neth Heart J.* 2016 Jan;24(1):66-72. doi: 10.1007/s12471-015-0770-x. PMID: 26649436. - **Addresses only effectiveness, not an RCT**
1804. Xu GJ, Gan TY, Tang BP, et al. Predictive factors and clinical effect of optimized cardiac resynchronization therapy. *Exp Ther Med.* 2013 2013 Jan;5(1):355-61 - **Not relevant to Key Questions**
1805. Yagishita D, Shoda M, Yagishita Y, et al. Time interval from left ventricular stimulation to QRS onset is a novel predictor of nonresponse to cardiac resynchronization therapy. *Heart Rhythm.* 2018 Sep 5doi: 10.1016/j.hrthm.2018.08.035. PMID: 30193853. - **Does not address outcome of interest**
1806. Yamamoto M, Seo Y, Ishizu T, et al. Prognostic significance of persistent restrictive filling pattern after cardiac resynchronization therapy. *J Echocardiogr.* 2015 Mar;13(1):20-6. doi: 10.1007/s12574-014-0234-0. PMID: 26184518. - **Does not address outcome of interest**

1807. Yamamoto T, Shimano M, Inden Y, et al. Cystatin C as a predictor of mortality and cardiovascular morbidity after cardiac resynchronization therapy. *Circ J*. 2013;77(11):2751-6 - **Not relevant to Key Questions**
1808. Yamasaki H, Lustgarten D, Cerkevnik J, et al. Adaptive CRT in patients with normal AV conduction and left bundle branch block: Does QRS duration matter? *Int J Cardiol*. 2017 Aug 1;240:297-301. doi: 10.1016/j.ijcard.2017.04.036. PMID: 28416247. - **Does not address outcome of interest**
1809. Yamasaki H, Sekiguchi Y, Nogami A, et al. Adaptive CRT algorithm-reducing the non-responder in CRT recipients with left bundle branch block and QRS 120-150 MS. *Journal of cardiac failure*. Conference: 21st annual scientific meeting of the Japanese heart failure society, JHFS 2017. Japan. 2017;23(10 Supplement 1):S9. doi: 10.1016/j.cardfail.2017.08.024. PMID: CN-01423336. - **Not full report**
1810. Yamashita S, Fukuzawa K, Yoshida A, et al. The effectiveness of cardiac resynchronization therapy for patients with New York Heart Association class IV non-ambulatory heart failure. *J Arrhythm*. 2015 Aug;31(4):221-5. doi: 10.1016/j.joa.2014.12.008. PMID: 26336563. - **Does not address outcome of interest**
1811. Yan J, Zhang S, Huang D, et al. Evaluation of the therapeutic effects of QuickOpt optimization in Chinese patients with chronic heart failure treated by cardiac resynchronization. *Sci Rep*. 2018 Mar 9;8(1):4259. doi: 10.1038/s41598-018-22525-0. PMID: 29523823. - **Does not address outcome of interest**
1812. Yanagisawa S, Inden Y, Shimano M, et al. Clinical characteristics and predictors of super-response to cardiac resynchronization therapy: a combination of predictive factors. *Pacing Clin Electrophysiol*. 2014 Nov;37(11):1553-64. doi: 10.1111/pace.12506. PMID: 25223930. - **Addresses only effectiveness, not an RCT**
1813. Yanagisawa S, Inden Y, Shimano M, et al. Impact of cardiac resynchronization therapy-defibrillator implantation on the association between body mass index and prognosis in patients with heart failure. *J Interv Card Electrophysiol*. 2015 Sep;43(3):269-77. doi: 10.1007/s10840-015-0015-3. PMID: 26003807. - **Addresses only effectiveness, not an RCT**
1814. Yang N, Liang ZG, Wang ZJ, et al. Combined myocardial deformation to predict cardiac resynchronization therapy response in nonischemic cardiomyopathy. *Pacing Clin Electrophysiol*. 2017 Sep;40(9):986-94. doi: 10.1111/pace.13151. PMID: 28691201. - **Does not address outcome of interest**
1815. Yang PS, Jeong J, You SJ, et al. The Burden and Risk Factors for Infection of Transvenous Cardiovascular Implantable

- Electronic Device: a Nationwide Cohort Study. Korean Circ J. 2019 Apr 8doi: 10.4070/kcj.2018.0361. PMID: 31074228. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1816. Yang S, Liu Z, Liu S, et al. Association of baseline big endothelin-1 level with long-term prognosis among cardiac resynchronization therapy recipients. Clin Biochem. 2018 Sep;59:25-30. doi: 10.1016/j.clinbiochem.2018.06.006. PMID: 29913121. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1817. Yang XW, Hua W, Wang J, et al. Native QRS narrowing reflects electrical reversal and associates with anatomical reversal in cardiac resynchronization therapy. J Interv Card Electrophysiol. 2014 Nov;41(2):161-8. doi: 10.1007/s10840-014-9936-5. PMID: 25227866. - **Does not address outcome of interest**
1818. Yang XW, Hua W, Wang J, et al. Regression of fragmented QRS complex: a marker of electrical reverse remodeling in cardiac resynchronization therapy. Ann Noninvasive Electrocardiol. 2015 Jan;20(1):18-27. doi: 10.1111/anec.12172. PMID: 25040593. - **Addresses only effectiveness, not an RCT**
1819. Yannopoulos D, Lurie KG, Sakaguchi S, et al. Reduced atrial tachyarrhythmia susceptibility after upgrade of conventional implanted pulse generator to cardiac resynchronization therapy in patients with heart failure. J Am Coll Cardiol. 2007 2007 Sep 25;50(13):1246-51 - **Not relevant to Key Questions**
1820. Yap LB, Nguyen ST, Qadir F, et al. A comparison of long-term outcomes between narrow and broad QRS complex patients treated with cardiac resynchronization therapy. Acta Cardiol. 2016 Jun;71(3):323-30. doi: 10.2143/ac.71.3.3152093. PMID: 27594128. - **Does not address outcome of interest**
1821. Yeo I, Kim LK, Lerman BB, et al. Impact of institutional procedural volume on inhospital outcomes after cardiac resynchronization therapy device implantation: US national database 2003-2011. Heart Rhythm. 2017 Dec;14(12):1826-32. doi: 10.1016/j.hrthm.2017.09.017. PMID: 28917564. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1822. Yiu KH, Lee KL, Lau CP, et al. Alleviation of pulmonary hypertension by cardiac resynchronization therapy is associated with improvement in central sleep apnea. Pacing Clin Electrophysiol. 2008 2008 Dec;31(12):1522-7 - **Not relevant to Key Questions**
1823. Yokoshiki H, Shimizu A, Mitsunashi T, et al. Prognostic significance of nonsustained ventricular tachycardia in patients receiving cardiac resynchronization therapy for primary prevention: Analysis of the Japan cardiac device treatment

- registry database. J Arrhythm. 2018 Apr;34(2):139-47. doi: 10.1002/joa3.12023. PMID: 29657589. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1824. Yokoshiki H, Shimizu A, Mitsuhashi T, et al. Survival and Heart Failure Hospitalization in Patients With Cardiac Resynchronization Therapy With or Without a Defibrillator for Primary Prevention in Japan--Analysis of the Japan Cardiac Device Treatment Registry Database. Circ J. 2017 Nov 24;81(12):1798-806. doi: 10.1253/circj.CJ-17-0234. PMID: 28626201. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1825. Ypenburg C, van Bommel RJ, Borleffs CJ, et al. Long-term prognosis after cardiac resynchronization therapy is related to the extent of left ventricular reverse remodeling at midterm follow-up. J Am Coll Cardiol. 2009 2009 Feb 10;53(6):483-90 - **Not relevant to Key Questions**
1826. Ypenburg C, van Bommel RJ, Delgado V, et al. Optimal left ventricular lead position predicts reverse remodeling and survival after cardiac resynchronization therapy. J Am Coll Cardiol. 2008 2008 Oct 21;52(17):1402-9 - **Not relevant to Key Questions**
1827. Ypenburg C, van Erven L, Bleeker GB, et al. Benefit of combined resynchronization and defibrillator therapy in heart failure patients with and without ventricular arrhythmias. J Am Coll Cardiol. 2006 2006 Aug 1;48(3):464-70. - **Addresses only effectiveness, not an RCT**
1828. Yu CM, Abraham WT, Bax J, et al. Predictors of response to cardiac resynchronization therapy (PROSPECT)--study design. Am Heart J. 2005 2005 Apr;149(4):600-5. - **No original data**
1829. Yu CM, Chau E, Sanderson JE, et al. Tissue Doppler echocardiographic evidence of reverse remodeling and improved synchronicity by simultaneously delaying regional contraction after biventricular pacing therapy in heart failure. Circulation. 2002 2002 Jan 29;105(4):438-45. - **Addresses only effectiveness, not an RCT**
1830. Yu CM, Fang F, Luo XX, et al. Long-term follow-up results of the pacing to avoid cardiac enlargement (PACE) trial. Eur J Heart Fail. 2014 Sep;16(9):1016-25. doi: 10.1002/ejhf.157. PMID: 25179592. - **Other: prior review**
1831. Yu CM, Fung JW, Chan CK, et al. Comparison of efficacy of reverse remodeling and clinical improvement for relatively narrow and wide QRS complexes after cardiac resynchronization therapy for heart failure. J Cardiovasc Electrophysiol. 2004 2004 Sep;15(9):1058-65. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1832. Yu CM, Fung JW, Zhang Q, et al. Improvement of serum NT-

- ProBNP predicts improvement in cardiac function and favorable prognosis after cardiac resynchronization therapy for heart failure. *J Card Fail.* 2005 2005 Jun;11(5 Suppl):S42-6. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1833. Yu CM, Fung WH, Lin H, et al. Predictors of left ventricular reverse remodeling after cardiac resynchronization therapy for heart failure secondary to idiopathic dilated or ischemic cardiomyopathy. *Am J Cardiol.* 2003 2003 Mar 15;91(6):684-8. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1834. Yu CM, Lin H, Fung WH, et al. Comparison of acute changes in left ventricular volume, systolic and diastolic functions, and intraventricular synchronicity after biventricular and right ventricular pacing for heart failure. *Am Heart J.* 2003 2003 May;145(5):E18. – **Not full report**
1835. Yu CM, Zhang Q, Chan YS, et al. Tissue Doppler velocity is superior to displacement and strain mapping in predicting left ventricular reverse remodelling response after cardiac resynchronisation therapy. *Heart.* 2006 2006 Oct;92(10):1452-6. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1836. Yu CM, Zhang Q, Yip GW, et al. Are left ventricular diastolic function and diastolic asynchrony important determinants of response to cardiac resynchronization therapy? *Am J Cardiol.* 2006 2006 Oct 15;98(8):1083-7. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1837. Yu Z, Chen X, Han F, et al. Electro-echocardiographic Indices to Predict Cardiac Resynchronization Therapy Non-response on Non-ischemic Cardiomyopathy. *Sci Rep.* 2017 Mar 10;7:44009. doi: 10.1038/srep44009. PMID: 28281560. - **Does not address outcome of interest**
1838. Yuan XP, White JA, Yee R, et al. Tissue Doppler imaging of mitral annular motion is an effective surrogate of left ventricular dyssynchrony and predicts response to cardiac resynchronization therapy. *J Am Soc Echocardiogr.* 2007 2007 Oct;20(10):1186-93.-**Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients.**
1839. Yucel H, Zorlu A, Kaya H, et al. Elevated neutrophil/lymphocyte ratio is associated with appropriate shock after ICD implantation. *Journal of Clinical and Analytical Medicine.* 2016;7(6):772-6. doi: 10.4328/jcam.3260. - **Does not address outcome of interest**
1840. Yufu K, Kondo H, Shinohara T, et al. Outcome of Patients With Cardiac Sarcoidosis Who

- Received Cardiac Resynchronization Therapy: Comparison With Dilated Cardiomyopathy Patients. *J Cardiovasc Electrophysiol.* 2017 Feb;28(2):177-81. doi: 10.1111/jce.13119. PMID: 27862596. - **Does not address outcome of interest**
1841. Zabek A, Malecka B, Haberka K, et al. The analysis of indications and early results of transvenous lead extraction in patients with a pacemaker, ICD and CRT - single-center experience. *Acta Cardiol.* 2015 Dec;70(6):685-92. doi: 10.2143/ac.70.6.3120181. PMID: 26717217. - **Addresses only effectiveness, not an RCT**
1842. Zaca V, Baiocchi C, Gaddi R, et al. Influence of aetiology on long-term effects of resynchronization on cardiac structure and function in patients treated with beta-blockers. *J Cardiovasc Med (Hagerstown).* 2011 2011 Apr;12(4):227-33 - **Not relevant to Key Questions**
1843. Zaeem F, Giedriemiene D, Coleman C, et al. CRT-D therapy in patients with decompensated NYHA class-four CHF. *Cardiol.Res. Pract.* 2012 2012;1(1) - **Not relevant to Key Questions**
1844. Zafir N, Bental T, Strasberg B, et al. Yield of left ventricular dyssynchrony by gated SPECT MPI in patients with heart failure prior to implantable cardioverter-defibrillator or cardiac resynchronization therapy with a defibrillator: Characteristics and prediction of cardiac outcome. *J Nucl Cardiol.* 2017 Feb;24(1):122-9. doi: 10.1007/s12350-015-0310-5. PMID: 26563336. - **Does not address outcome of interest**
1845. Zagrodzky JD, Ramaswamy K, Page RL, et al. Biventricular pacing decreases the inducibility of ventricular tachycardia in patients with ischemic cardiomyopathy. *Am J Cardiol.* 2001 2001 May 15;87(10):1208-10; A7.-**Other: <30 patients**
1846. Zahwe F, Singh KY, Ballany W, et al. Incidence of super-response with optimized dual site LV cardiac resynchronization therapy. *Europace. Conference: world congress in cardiac electrophysiology and cardiac techniques 2016.* France. 2016;18:i107. doi: 10.1093/europace/euw158. PMID: CN-01406323. - **Not full report**
1847. Zakine C, Garcia R, Narayanan K, et al. Prophylactic implantable cardioverter-defibrillator in the very elderly. *Europace.* 2019((Zakine C.; Narayanan K.; Perier M.-C.; Marijon E.) Paris Cardiovascular Research Center, Paris, France)doi: 10.1093/europace/euz041. - **Other: No comparison of interest**
1848. Zakine C, Garcia R, Narayanan K, et al. Prophylactic implantable cardioverter-defibrillator in the very elderly. *Europace.* 2019((Zakine C.; Narayanan K.; Perier M.-C.; Marijon E.) Paris Cardiovascular Research Center, Paris, France)doi: 10.1093/europace/euz041. - **Other: No comparison of interest**

1849. Zanon F, Aggio S, Baracca E, et al. Reduced mitral regurgitation in heart failure patients submitted to cardiac resynchronization therapy: a short-term prospective study. *Ital Heart J.* 2004 2004 Nov;5(11):826-30. -Other: Study does not adjust via model or participant selection for at least 2 predictor of Gender, QRS Duration and/or Morphology (LBB or not) and does not include at least 30 patients. - **Other: no mv adjustment**
1850. Zanon F, Aggio S, Baracca E, et al. Ventricular-arterial coupling in patients with heart failure treated with cardiac resynchronization therapy: may we predict the long-term clinical response? *Eur J Echocardiogr.* 2009 2009 Jan;10(1):106-11. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1851. Zanon F, Baracca E, Pastore G, et al. Determination of the longest inpatient left ventricular electrical delay may predict acute hemodynamic improvement in patients after cardiac resynchronization therapy. *Circ Arrhythm Electrophysiol.* 2014 Jun;7(3):377-83. doi: 10.1161/circep.113.000850. PMID: 24668162 - **Not relevant to Key Questions**
1852. Zanon F, Baracca E, Pastore G, et al. Determination of the longest inpatient left ventricular electrical delay may predict acute hemodynamic improvement in patients after cardiac resynchronization therapy. *Circ Arrhythm Electrophysiol.* 2014 Jun;7(3):377-83. doi: 10.1161/circep.113.000850. PMID: 24668162. -**Other: prior review**
1853. Zanon F, Baracca E, Pastore G, et al. Determination of the longest inpatient left ventricular electrical delay may predict acute hemodynamic improvement in patients after cardiac resynchronization therapy. *Circ Arrhythm Electrophysiol.* 2014 Jun;7(3):377-83. doi: 10.1161/circep.113.000850. PMID: 24668162. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1854. Zanon F, Baracca E, Pastore G, et al. Multipoint pacing by a left ventricular quadripolar lead improves the acute hemodynamic response to CRT compared with conventional biventricular pacing at any site. *Heart Rhythm.* 2015 May;12(5):975-81. doi: 10.1016/j.hrthm.2015.01.034. PMID: 25625721. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1855. Zanon F, Marcantoni L, Baracca E, et al. Hemodynamic comparison of different multisites and multipoint pacing strategies in cardiac resynchronization therapies. *J Interv Card Electrophysiol.* 2018 Oct;53(1):31-9. doi: 10.1007/s10840-018-0362-y. PMID: 29627954. - **Addresses only effectiveness, not an RCT**
1856. Zanon F, Marcantoni L, Baracca E, et al. Optimization of left ventricular pacing site plus

- multipoint pacing improves remodeling and clinical response to cardiac resynchronization therapy at 1 year. *Heart Rhythm*. 2016 Aug;13(8):1644-51. doi: 10.1016/j.hrthm.2016.05.015. PMID: 27450156. - **Does not address outcome of interest**
1857. Zavadovsky KV, Gulya MO, Lishmanov YB, et al. Perfusion and metabolic scintigraphy with (123)I-BMIPP in prognosis of cardiac resynchronization therapy in patients with dilated cardiomyopathy. *Ann Nucl Med*. 2016 Jun;30(5):325-33. doi: 10.1007/s12149-016-1064-0. PMID: 26872805. - **Addresses only effectiveness, not an RCT**
1858. Zecchin M, Proclemer A, Magnani S, et al. Long-term outcome of 'super-responder' patients to cardiac resynchronization therapy. *Europace*. 2014 2014 Mar;16(3):363-71 - **Not relevant to Key Questions**
1859. Zecchin M, Proclemer A, Magnani S, et al. Long-term outcome of 'super-responder' patients to cardiac resynchronization therapy. *Europace*. 2014;16(3):363-71. doi: 10.1093/europace/eut339. - **Addresses only effectiveness, not an RCT**
1860. Zeitler EP, Friedman DJ, Daubert JP, et al. Multiple Comorbidities and Response to Cardiac Resynchronization Therapy: MADIT-CRT Long-Term Follow-Up. *J Am Coll Cardiol*. 2017 May 16;69(19):2369-79. doi: 10.1016/j.jacc.2017.03.531. PMID: 28494974. - **Does not address outcome of interest**
1861. Zeitler EP, Piccini JP, Hellkamp AS, et al. Exercise training and pacing status in patients with heart failure: results from HF-ACTION. *J Card Fail*. 2015 Jan;21(1):60-7. doi: 10.1016/j.cardfail.2014.10.004. PMID: 25463413. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1862. Zhang H, Dai Z, Xiao P, et al. The left ventricular lead electrical delay predicts response to cardiac resynchronisation therapy. *Heart Lung Circ*. 2014 Oct;23(10):936-42. doi: 10.1016/j.hlc.2014.04.002. PMID: 24996391. - **Does not address outcome of interest**
1863. Zhang HB, Meng X, Han J, et al. Transvenous versus open chest lead placement for resynchronization therapy in patients with heart failure: comparison of ventricular electromechanical synchronicity. *J Geriatr Cardiol*. 2017 Apr;14(4):261-5. doi: 10.11909/j.issn.1671-5411.2017.04.001. PMID: 28663764. - **Addresses only effectiveness, not an RCT**
1864. Zhang J, Wang Z, Cheng L, et al. Immediate clinical outcomes of left bundle branch area pacing vs conventional right ventricular pacing. *Clin Cardiol*. 2019 Jun 11doi: 10.1002/clc.23215. PMID: 31184785. - **Does not evaluate a CRT**

1865. Zhang J, Xing Q, Zhou X, et al. Effects of Cardiac Resynchronization Therapy on Ventricular Electrical Remodeling in Patients With Heart Failure. *Int Heart J.* 2015;56(5):495-9. doi: 10.1536/ihj.15-104. PMID: 26370368. - **Does not address outcome of interest**
1866. Zhang J, Zhang Y, Zhou X, et al. QRS duration shortening predicts left ventricular reverse remodelling in patients with dilated cardiomyopathy after cardiac resynchronization therapy. *Acta Cardiol.* 2015 Jun;70(3):307-13. doi: 10.2143/ac.70.3.3080635. PMID: 26226704. - **Does not address outcome of interest**
1867. Zhang Q, Chan YS, Liang YJ, et al. Comparison of left ventricular reverse remodeling induced by cardiac contractility modulation and cardiac resynchronization therapy in heart failure patients with different QRS durations. *Int J Cardiol.* 2013 2013 Aug 10;167(3):889-93 - **Not relevant to Key Questions**
1868. Zhang Q, Chan YS, Liang YJ, et al. Comparison of left ventricular reverse remodeling induced by cardiac contractility modulation and cardiac resynchronization therapy in heart failure patients with different QRS durations. *Int J Cardiol.* 2013 2013 Aug 10;167(3):889-93. - **Addresses only effectiveness, not an RCT**
1869. Zhang Q, Chan YS, Liang YJ, et al. Comparison of left ventricular reverse remodeling induced by cardiac contractility modulation and cardiac resynchronization therapy in heart failure patients with different QRS durations. *Int J Cardiol.* 2013;167(3):889-93. doi: 10.1016/j.ijcard.2012.01.066. PMID: 22330007
1870. Zhang Q, Fung JW, Auricchio A, et al. Differential change in left ventricular mass and regional wall thickness after cardiac resynchronization therapy for heart failure. *Eur Heart J.* 2006 2006 Jun;27(12):1423-30 - **Not relevant to Key Questions**
1871. Zhang Q, Fung JW, Auricchio A, et al. Differential change in left ventricular mass and regional wall thickness after cardiac resynchronization therapy for heart failure. *Eur Heart J.* 2006 2006 Jun;27(12):1423-30. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1872. Zhang Q, Fung JW, Chan JY, et al. Difference in long-term clinical outcome after cardiac resynchronisation therapy between ischaemic and non-ischaemic aetiologies of heart failure. *Heart.* 2009 2009 Feb;95(2):113-8. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1873. Zhang X, Qian Z, Tang H, et al. A new method to recommend left ventricular lead positions for improved CRT volumetric response and long-term prognosis. *Journal of Nuclear Cardiology.* 2019((Zhang X.; Qian Z.; Wang Y.; Hou X.; Zou J., jgzou@njmu.edu.cn) Department of Cardiology, The First Affiliated Hospital of Nanjing Medical University, Guangzhou Road 300,

- Nanjing, Jiangsu, China)doi:
10.1007/s12350-019-01735-7. -
**Does not address outcome of
interest**
1874. Zhang XY, Shan QJ, Su YG, et al. Efficacy of biventricular pacing on preventing heart failure in patients with high degree atrioventricular block (BIVPACE-AVB Trial). *Zhonghua xin xue guan bing za zhi*. 2016;44(4):331-7. PMID: CN-01263943. – **Not in English**
1875. Zhang Y, Guallar E, Blasco-Colmenares E, et al. Changes in Follow-Up Left Ventricular Ejection Fraction Associated With Outcomes in Primary Prevention Implantable Cardioverter-Defibrillator and Cardiac Resynchronization Therapy Device Recipients. *J Am Coll Cardiol*. 2015 Aug 4;66(5):524-31. doi: 10.1016/j.jacc.2015.05.057. PMID: 26227190. - **Does not address outcome of interest**
1876. Zhao S, Chen K, Su Y, et al. Association between patient activity and long-term cardiac death in patients with implantable cardioverter-defibrillators and cardiac resynchronization therapy defibrillators. *Eur J Prev Cardiol*. 2017;24(7):760-7. doi: 10.1177/2047487316688982. PMID: 28117620
1877. Zhao X, Shuang L, Tan RS, et al. Computer-based assessment of ventricular mechanical synchrony from magnetic resonance imaging. *Conf Proc IEEE Eng Med Biol Soc*. 2015;2015:6536-9. doi: 10.1109/embc.2015.7319890. PMID: 26737790. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1878. Zhou XH, Umesh Y, Li YD, et al. Applicability of a novel delivery system in the context of left ventricular lead implantation at optimal position in cardiac resynchronization therapy: A single center experience. *Experimental and Clinical Cardiology*. 2014;20(7):1023-40. - **Does not address outcome of interest**
1879. Zhu M, Chen H, Fulati Z, et al. Left ventricular global longitudinal strain and mechanical dispersion predict response to multipoint pacing for cardiac resynchronization therapy. *J Clin Ultrasound*. 2019 Jan 11doi: 10.1002/jcu.22687. PMID: 30632611. - **Addresses effectiveness questions only and is not RCT**
1880. Zhu M, Chen H, Fulati Z, et al. The value of left ventricular strain-volume loops in predicting response to cardiac resynchronization therapy. *Cardiovasc Ultrasound*. 2019 Feb 18;17(1):3. doi: 10.1186/s12947-019-0153-3. PMID: 30777069. - **Does not address outcome of interest**
1881. Ziacchi M, Defaye P, Morgan JM, et al. Left ventricular endocardial pacing for nonresponders to CRT, a subgroup analysis of the alsync study. *Europace*. Conference: world congress in cardiac electrophysiology and cardiac techniques 2016. France. 2016;18:i85. doi:

- 10.1093/europace/euw158. PMID: CN-01406391. – **Not full report**
1882. Ziacchi M, Diemberger I, Biffi M, et al. Predictors of nonsimultaneous interventricular delay at cardiac resynchronization therapy optimization. *J Cardiovasc Med (Hagerstown)*. 2016 Apr;17(4):299-305. doi: 10.2459/jcm.0000000000000196. PMID: 25469730. - **Does not address outcome of interest**
1883. Ziacchi M, Giannola G, Lunati M, et al. Bipolar active fixation left ventricular lead or quadripolar passive fixation lead? An Italian multicenter experience. *J Cardiovasc Med (Hagerstown)*. 2019;20(4):192-200. doi: 10.2459/jcm.0000000000000778. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1884. Ziacchi M, Saporito D, Zardini M, et al. Left Ventricular Reverse Remodeling Elicited by a Quadripolar Lead: Results from the Multicenter Per4mer Study. *Pacing Clin Electrophysiol*. 2016 Mar;39(3):250-60. doi: 10.1111/pace.12792. PMID: 26643691. - **Addresses only effectiveness, not an RCT**
1885. Ziacchi M, Zucchelli G, Ricciardi D, et al. Left ventricular attain performa quadripolar leads: performance and clinical comparison with left ventricular bipolar leads in cardiac resynchronization therapy. results from the multicenter jump performa analysis. *Europace*. Conference: world congress in cardiac electrophysiology and cardiac techniques 2016. France. 2016;18:i105. doi: 10.1093/europace/euw158. PMID: CN-01406338. – **Not full report**
1886. Ziaeeian B, Zhang Y, Albert NM, et al. Clinical effectiveness of CRT and ICD therapy in heart failure patients by racial/ethnic classification: insights from the IMPROVE HF registry. *J Am Coll Cardiol*. 2014 Aug 26;64(8):797-807. doi: 10.1016/j.jacc.2014.05.060. PMID: 25145524. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1887. Zile MR, Abraham WT, Weaver FA, et al. Baroreflex activation therapy for the treatment of heart failure with a reduced ejection fraction: safety and efficacy in patients with and without cardiac resynchronization therapy. *Eur J Heart Fail*. 2015 Oct;17(10):1066-74. doi: 10.1002/ejhf.299. PMID: 26011593. - **Population inclusion criteria do not fall within the QRS \geq 120ms and LVEF \leq 35% range**
1888. Žižek D, Cvijić M, Ležaić L, et al. Impact of myocardial viability assessed by myocardial perfusion imaging on ventricular tachyarrhythmias in cardiac resynchronization therapy. *Journal of Nuclear Cardiology*. 2013;20(6):1049-59. doi: 10.1007/s12350-013-9795-y. PMID: 24136364. - **Addresses only effectiveness, not an RCT**
1889. Zizek D, Cvijic M, Tasic J, et al. Effect of cardiac resynchronization therapy on beat-to-beat T-wave amplitude

- variability. *Europace*. 2012 2012 Nov;14(11):1646-52 - **Not relevant to Key Questions**
1890. Zizek D, Cvijic M, Tasic J, et al. Effect of cardiac resynchronization therapy on beat-to-beat T-wave amplitude variability. *Europace*. 2012 2012 Nov;14(11):1646-52. - **Addresses only effectiveness, not an RCT**
1891. Zuoan Q, Ruijie L, Tao G. The feasibility study on the biventricular pacing both dynamic combined of atrioventricular nodal conduction to improve the treatment of heart failure. *Journal of the american college of cardiology*. 2014;64(16 SUPPL. 1):C185. PMID: CN-01054402. - **Does not address outcome of interest**
1892. Zusterzeel R, Canos DA, Sanders WE, et al. Comparative Effectiveness of Cardiac Resynchronization Therapy Defibrillators Versus Standard Implantable Defibrillators in Medicare Patients. *Am J Cardiol*. 2015 Jul 1;116(1):79-84. doi: 10.1016/j.amjcard.2015.03.037. PMID: 25933736. - **Addresses only effectiveness, not an RCT**
1893. Zusterzeel R, Curtis JP, Canos DA, et al. Sex-specific mortality risk by QRS morphology and duration in patients receiving CRT: results from the NCDR. *J Am Coll Cardiol*. 2014 Sep 2;64(9):887-94. doi: 10.1016/j.jacc.2014.06.1162. PMID: 25169173. - **Addresses only effectiveness, not an RCT**
1894. Zusterzeel R, Spatz ES, Curtis JP, et al. Cardiac resynchronization therapy in women versus men: observational comparative effectiveness study from the National Cardiovascular Data Registry. *Circ Cardiovasc Qual Outcomes*. 2015 Mar;8(2 Suppl 1):S4-11. doi: 10.1161/circoutcomes.114.001548 . PMID: 25714821. - **Does not address outcome of interest**
1895. Zweerink A, Friedman DJ, Klem I, et al. Size Matters. *Circ Arrhythm Electrophysiol*. 2018;11(12):e006767. doi: 10.1161/circep.118.006767. - **Does not address outcome of interest**
1896. Zweerink A, Friedman DJ, Klem I, et al. Size Matters: Normalization of QRS Duration to Left Ventricular Dimension Improves Prediction of Long-Term Cardiac Resynchronization Therapy Outcome. *Circ Arrhythm Electrophysiol*. 2018 Dec;11(12):e006767. doi: 10.1161/circep.118.006767. PMID: 30541355. - **Does not address outcome of interest**

Appendix D: Evidence tables

Table D1: Study characteristics of included articles

Author, Year Trial	Planned length of follow-up (months)	Study design	Device type, Device name	Funding source
CARE-HF Main Trial- Cleland,2004 ¹ Sub Studies- Cleland,2006 ² Cleland,2007 ³ Cleland,2009 ⁴ Cleland,2012 ⁵ Ghio,2009 ⁶ Gras,2007 ⁷ Wikstrom,2009 ⁸	18	RCT	CRT-P , Medtronic InSync or InSync III device	Industry
MADIT CRT Main Trial- Moss,2009 ⁹ Sub Studies- Arshad,2011 ¹⁰ Barsheshet,2011 ¹¹ Biton, 2015 ¹² Biton, 2016 ¹³ MADIT Sub Study Biton, 2018 ¹⁴ Goldenberg,2014 ¹⁵ Hsu,2012 ¹⁶ Jamerson,2014 ¹⁷ Ouellet,2012 ¹⁸ Ruwald,2014 ¹⁹ Sabbag, 2016 ²⁰ Solomon,2010 ²¹ Stockburger, 2016 ²² MADIT study Tompkins,2013 ²³ Zareba,2011 ²⁴	36	RCT	CRT-D , Boston Scientific	Industry

Table D1: Study characteristics of included articles (continued)

Author,Year Trial	Planned length of follow-up (months)	Study design	Device type, Device name	Funding source
RAFT Main Trial- Tang,2010 ²⁵ Sub Studies- Birnie,2013 ²⁶ Essebag, 2015 ²⁷ Gilis,2014 ²⁸ Healey,2012 ²⁹ Sapp, 2017 ³⁰	60	RCT	CRT-D , Commercially available transvenous leads and devices (Medtronic)	Funded by the Canadian Institutes of Health Research and Medtronic of Canada
MIRACLE ICD Main Trial- Young,2003 ³¹	6	RCT	CRT-D , InSync Model 8040, Medtronic	Industry
MIRACLE Main Trial- Abraham,2002 ³² Sub Study- Sutton,2003 ³³	6	RCT	CRT-P , InSync Model 8040, Medtronic	Industry
COMPANION Main Trial- Bristow,2004 ³⁴ Sub Studies- Anand, 2009 ³⁵ Carson,2005 ³⁶ Kalscheur, 2017 ³⁷ Shamoun, 2019 ³⁸	2 years; median follow-up varied for each group (11.9 months arm 1; 16.2 months arm 2; 15.7 months arm 3)	RCT	CRT-P and D , Pacemakers were Contak TR model 1241, Guidant; CRT-D was Contac CD model 1823, Guidant)	Industry
MUSTIC Main Trial- Cazeau,2001 ³⁹ Sub Study- Leclercq,2002 ⁴⁰	6	RCT	CRT-P, Chorum 7336 MSP, ELA Medical, Montrouge, France, and InSync 8040, Medtronic	Industry
Abraham,2004 ⁴¹ MIRACLE ICD II Trial	6	RCT	CRT-D , Model 7272 InSync ICD, Medtronic, Inc Industry	NR

Table D1: Study characteristics of included articles (continued)

Author,Year Trial	Planned length of follow-up (months)	Study design	Device type, Device name	Funding source
MASCOT Sub Study- Schuchert,2013 ⁴²	12	RCT	CRT-P and D , Frontierw or Frontierw II CRT-P or Epicw HF or Atlasw HF CRT-D	Industry St. Jude Medical
Adelstein, 2016 ⁴³	Mean: 52 (SD 36)	Retrospective cohort	CRT-D	Other-specify; Industry support for individual investigators
Auricchio,2014 ⁴⁴ CLEPSYDRASub Study-	13	Prospective cohort	CRT-D , Paradym™ RF CRT-D	Industry
Azizi, 2006 ⁴⁵	1.7 +/- 1.3 years	Retrospective cohort	CRT-P and D , Tripos DR, Stratos, Chorus MSP, Talent MSP, Contak TR.TR2, Insync 8040, Insync III, Frontier, Vitatron, Tupos, Koronos, Renewal, Insync ICD, Insync Marquis, Sentry, Atlas, Epic	NR
Barra, 2018 ⁴⁶	Mean: 41.4 (SD 29)	Prospective cohort	CRT-P and D	Other-specify; no external funding
Bencardino, 2016 ⁴⁷	3	RCT	CRT-P	NR
Bhatt, 2018 ⁴⁸	24	Prospective cohort	His bundle pacing, 69-cm Medtronic SelecSecure 3830	NR
Bossard,2014 ⁴⁹	NR	Retrospective cohort	CRT-D , NR	No Funding
Boven,2013 ⁵⁰	NR	Retrospective cohort	CRT-D , NR	NR
Boven,2013 ⁵¹	NR	Retrospective cohort	CRT-P and D , Medtronic Inc.,Minneapolis, MN, USA or Boston Scientific Inc., Indianapolis, IN, USA	NR
Cock, 2003 ⁵²	2-3	Prospective cohort	CRT-P , Medtronic LDS, Biotronik SCOUT	NR
Crossley, 2015 ⁵³	Mean 6.6 (SD 2.8)	Other: controlled clinical trial	CRT-D, Pulse generators (VivaQuadC,VivaQuadXT,VivaQuadS ,and Brava Quad),	Industry
Diab, 2011 ⁵⁴	6	RCT	CRT-D , NR	Unclear, some investigators receive funds, but not wholly funded study
Doring, 2018 ⁵⁵	Mean 23.5 and 27.6	Prospective cohort	CRT-P and D	Other-specify; no external funding
Duray,2008 ⁵⁶	6	Prospective cohort	CRT-D , NR	Other-specify No external financial support

Table D1: Study characteristics of included articles (continued)

Author,Year Trial	Planned length of follow-up (months)	Study design	Device type, Device name	Funding source
Echouffo-Tcheugui, 2016 ⁵⁷	36	Retrospective cohort	CRT-D	Non-profit
Forleo, 2015 ⁵⁸	6	Prospective cohort	quadripolar, CRT D, Quartet lead (Quartet 1458Q, St. Jude Medical, Sylmar, CA); In the control group, different market released LV leads from five manufacturers (Boston Scientific Corp., Natick, MA; Medtronic Inc., Minneapolis, MN; St. Jude Medical Inc., Sylmar, CA; Sorin Group CRM, France; Biotronik, Berlin, Germany)	Other-specify; no external funding
Friedman, 2015 ⁵⁹	36	Retrospective cohort	CRT-D	Non-profit
Garikipati, 2014 ⁶⁰	12	RCT	CRT-P , NR	NR
Gasparini, 2009 ⁶¹ RELEVANT Study	NR	Prospective cohort	CRT-D , Medtronic InSync III Protect device and InSync III Marquis, InSync Maximo, InSync Sentry, Medtronic Inc., Minneapolis, MN, USA	Industry
Gopalapurugan, 2014 ⁶²	NA	Retrospective cohort	CRT-D, NR	NR
Gras, 2002 ⁶³	12	Prospective cohort	CRT-P , InSync model 8040	Industry
Haugaa, 2014 ⁶⁴	24	Prospective cohort	CRT-D, NR	NR
Higgins, 2003 ⁶⁵ VENTAK CHF/CONTAK CD	6	RCT	CRT-D , Industry	NR
Hoke, 2014 ⁶⁶	Median 38.6	Retrospective cohort	CRT-D, Biotronik (Berlin, Germany), Boston Scientific (Natick, MA, formerly CPI; Guidant, St Paul, MN), and Medtronic (Minneapolis, MN).	Industry
Hong-xia, 2006 ⁶⁷	NR	Prospective cohort	CRT-P , Impulse generator: Insync 8040, Insync III 8042 (Medtronic, USA). LV lead: 2188, 2187, 4189, 4191, 4193 (Medtronic, USA)	NR
Khazanie, 2016 ⁶⁸	36	Retrospective cohort	CRT-D	Government
Killu, 2017 ⁶⁹	Mean: 74.4 (SD 2.7)	Retrospective cohort	CRT-D, Boston scientific, Medtronic, St Jude	NR
Killu, 2011 ⁷⁰	NR	Retrospective cohort	CRT-P and D , NR	NR
Knight, 2004 ⁷¹	9	Prospective cohort	CRT-D , NR	NR
Kober, 2016 ⁷²	Median 67.6	RCT	CRT-P and D	Industry

Table D1: Study characteristics of included articles (continued)

Author,Year Trial	Planned length of follow-up (months)	Study design	Device type, Device name	Funding source
Krahn,2002 ⁷³	NR	Prospective cohort	CRT-P , InSync model 8040, 7272, 8042	Non-profit
Kronborg, 2018 ⁷⁴	24	Retrospective cohort	CRT-D	NR
Kuhlkamp, 2002 ⁷⁵	Median: 185 days	Prospective cohort	CRT-D, InSync 7272 ICD	Industry
Laish-Farkash, 2018 ⁷⁶	30	Prospective cohort	Quadripolar, Medtronic-46%, Biotronik-23%, Guidant (Boston Scientific)-15.5%, St. Jude Medical-15.5%	NR
Landolina,2011 ⁷⁷	NR	Prospective cohort	CRT-D , NR	Industry
Leclercq,2007 ⁷⁸ RD-CHF Study	6	Randomized cross over	CRT-P , NR	NR
Leclercq, 2019 ⁷⁹	72	RCT	Multipoint pacing, NR	Industry
Looi, 2017 ⁸⁰	108	Retrospective cohort	CRT-D	NR
Looi, 2018 ⁸¹	48	Prospective cohort	CRT-P and D, NR	NR
Lozano,2000 ⁸²	3	RCT	CRT-P , NR	NR
Masoudi,2014 ⁸³	NA	Retrospective cohort	CRT-D, NR	Government
Mortensen,2004 ⁸⁴	6	Prospective cohort	CRT-P , InSync III® CRT-P	NR
Nakajima, 2018 ⁸⁵	48.8	Prospective cohort	CRT-P and D	NR
Nezorov, 2018 ⁸⁶	12	Retrospective cohort	CRT-P and D	NR
Nian-Sang,2010 ⁸⁷	NR	Retrospective cohort	CRT-D , NR	NR
Pinter,2009 ⁸⁸	6	RCT	CRT-D , CONTACT CD CHF Device, model no. 1,823, or CONTACT RENEWAL HF Device, model no. H135	Industry
Ricci,2014 ⁸⁹	NR	Prospective cohort	CRT-D, Medtronic CRT-ICD	Industry
Rickard,2013 ⁹⁰	NR	Retrospective cohort	CRT-P and D , NR	NR

Table D1: Study characteristics of included articles (continued)

Author,Year Trial	Planned length of follow-up (months)	Study design	Device type, Device name	Funding source
Romeyer-Bouchard,2010 ⁹¹	NR	Prospective cohort	CRT-P and D , NR	NR
Sardu, 2017 ⁹²	12	RCT	Quadripolar, St Jude, Medtronic, Quadra Assura, Viva Quad XT, Viva Quad S	Other-specify; no external funding
Sardu, 2017 ⁹³	12	Prospective cohort	CRT-D	NR
Shan, 2018 ⁹⁴	Mean 36.2	Prospective cohort	His bundle pacing, Medtronic SelecSecure 3830	NR
Stahlberg,2005 ⁹⁵	36	Prospective cohort	CRT-P , InSync,Thera,Kappa,Chorum,Talent,Frontier,Affinity	NR
Steffel, 2015 ⁹⁶	6	RCT	CRT-D, Biotronik Lumax HF-T CRT-D	Industry
Strimel, 2011 ⁹⁷	34 (mean)	Retrospective cohort	CRT-D , NR	NR
Su, 2018 ⁹⁸	24	Prospective cohort	CRT-D, NR	Government
Swindle,2010 ⁹⁹	NR	Retrospective cohort	CRT-P and D , NR	Government
Takaya,2014 ¹⁰⁰	6	Prospective Cohort	NR	None
Theuns,2005 ¹⁰¹	NR	Prospective cohort	CRT-D , InSync 7272 and 7279 (Medtronic Inc., Minneapolis, MN,USA), Contak CD, Renewal I, and Renewal II (GuidantInc., St. Paul, MN, USA), and Epic HF	NR
Vado,2014 ¹⁰²	NR	Prospective cohort	CRT-D, NR	NR
Verbrugge,2013 ¹⁰³	NA	Retrospective cohort	CRT-P and D , NR	No Funding
Verbrugge,2013 ¹⁰⁴	NR	Prospective cohort	CRT-P and D , NR	Industry

Table D1: Study characteristics of included articles (continued)

Author,Year Trial	Planned length of follow-up (months)	Study design	Device type, Device name	Funding source
Ziacchi, 2018 ¹⁰⁵	12	Prospective cohort	CRT-D	NR
Ziacchi, 2018 ¹⁰⁶	15	Retrospective cohort	Quadripolar, Medtronic CRT device (Attain Performa)	NR
Zue, 2016 ¹⁰⁷	12	Prospective cohort	CRT-D	Other-specify; no external funding

CRT-P=Cardiac Resynchronization Therapy Paced,CRT-D= Cardiac Resynchronization Therapy with Defibrillator,NR=Not Reported

Table D2: Population characteristics –CRT P effectiveness

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Abraham,2002 ³ MIRACLE	Arm 1(Control group):225	F: 72(32) W:205(91)	Mean: 64.7 Med: NR Range: NR SD: 11.2	131(58)	NR	Mean: 165 Med: NR Range: NR SD: 20	NR	III: 205(91)	Mean: 21.6 Med: NR Range: NR SD: 6.2	Creat: NR GFR: NR
Abraham,2002 ³ MIRACLE	Arm 2(Cardiac Resynchronization Group):228	F: 73(32) W:205(90)	Mean: 63.9 Med: NR Range: NR SD: 10.7	114(50)	NR	Mean: 167 Med: NR Range: NR SD: 21	NR	III: 205(90)	Mean: 21.8 Med: NR Range: NR SD: 6.3	Creat: NR GFR: NR
Anand, 2009 ³⁵ COMPANION Sub Study	Arm 1(OPT):308	F: 96(31) NR	Mean: NR Med: 68 Range: NR SD: NR	NR(59)	NR	Mean: NR Med: 158 Range: NR SD: NR	NR	III: NR(82)	Mean: 22 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Anand, 2009 ³⁵ COMPANION Sub Study	Arm 2(CRT-P):617	F: 203(33) NR	Mean: NR Med: 67 Range: NR SD: NR	NR(54)	NR	Mean: NR Med: 160 Range: NR SD: NR	NR	III: NR(87)	Mean: 20 Med: NR Range: NR SD: NR	Creat: NR GFR: NR

Table D2: Population characteristics –CRT P effectiveness (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Anand, 2009 ³⁵ COMPANION Sub Study	Arm 3(CRT- D):595	F: 196(33) NR	Mean: NR Med: 66 Range: NR SD: NR	NR(55)	NR	Mean: NR Med: 160 Range: NR SD: NR	NR	III: NR(86)	Mean: 22 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Bristow,2004 ³⁴ COMPANION	Arm 1(Optimal Pharmacologic al Therapy):308	F: 96(31) NR	Mean: 68 Med: NR Range: NR SD: NR	NR(59)	NR	Mean: 158 Med: NR Range: NR SD: NR	LBBB:NR(70) RBBB: NR(9) IVCD: NR PBBBlock: NR	III: NR(82)	Mean: 22 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Bristow,2004 ³⁴ COMPANION	Arm 2(CRT- P):617	F: 203(33) NR	Mean: 67 Med: NR Range: NR SD: NR	NR(54)	NR	Mean: 160 Med: NR Range: NR SD: NR	LBBB:NR(69) RBBB:NR(12) IVCD: NR PBBBlock: NR	III: NR(87)	Mean: 20 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Bristow,2004 ³⁴ COMPANION	Arm 3(CRT- D):595	F: 196(33) NR	Mean: 66 Med: NR Range: NR SD: NR	NR(55)	NR	Mean: 160 Med: NR Range: NR SD: NR	LBBB:NR(73) RBBB:NR(10) IVCD: NR PBBBlock: NR	III: NR(86)	Mean: 22 Med: NR Range: NR SD: NR	Creat: NR GFR: NR

Table D2: Population characteristics –CRT P effectiveness (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Carson,2005 ³⁶ COMPANION Sub Study	Arm 1(Optimal Pharmacologic al therapy):308	F: 96(31) NR	Mean: 68 Med: NR Range: NR SD: NR	NR(59)	NR	Mean: 158 Med: NR Range: NR SD: NR	LBBB:NR(70) RBBB: NR(9) IVCD: NR PBBBlock: NR	III: NR(82)	Mean: 22 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Carson,2005 ³⁶ COMPANION Sub Study	Arm 2(CRT- P):617	F: 203(33) NR	Mean: 67 Med: NR Range: NR SD: NR	NR(54)	NR	Mean: 160 Med: NR Range: NR SD: NR	LBBB:NR(69) RBBB:NR(12) IVCD: NR PBBBlock: NR	III: NR(87)	Mean: 20 Med: NR Range:NR SD: NR	Creat: NR GFR: NR
Carson,2005 ³⁶ COMPANION Sub Study	Arm 3(CRT- D):595	F: 196(33) NR	Mean: 66 Med: NR Range: NR SD: NR	NR(55)	NR	Mean: 160 Med: NR Range: NR SD: NR	LBBB:NR(73) RBBB:NR(10) IVCD: NR PBBBlock: NR	III: NR(86)	Mean: 22 Med: NR Range: NR SD: NR	Creat: NR GFR: NR

Table D2: Population characteristics –CRT P effectiveness (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Cazeau,2001 ³⁹ MUSTIC	All patients	F: 17(25.4) NR	Mean: 63 Med: NR Range: NR SD: 10	NR	NR	Mean: 176 Med: NR Range: NR SD: 19	LBBB:NR(87) RBBB:NR(10) IVCD: NR PBBBlock: NR	III: 67(100)	Mean: 23 Med: NR Range: NR SD: 7	Creat: NR GFR: NR
Cazeau,2001 ³⁹ MUSTIC	All patients	F: 8(17.8) NR	Mean: 66 Med: NR Range: NR SD: 9	NR	45(100)	Mean: 207 Med: NR Range: NR SD: 17	NR	III: 45(100)	Mean: 25 Med: NR Range: NR SD: 10	Creat: NR GFR: NR
Cleland,2004 ¹ CARE-HF	Arm 1(Medical Therapy Alone):404	F: 111(27) NR	Mean: NR Med: 66 Range: NR SD: NR	144(36)	NR	Mean: NR Med: 160 Range: 152- 180 SD: NR	NR	IV: 27(7)	Mean: NR Med: 25 Range: NR SD: NR	Creat: NR GFR: 61ml/min/1 .73m ²
Cleland,2004 ¹ CARE-HF	Arm 2(Medical Therapy plus Cardiac Resynchroniza tion(CRT- P):409	F: 105(26) NR	Mean: NR Med: 67 Range: NR SD: NR	165(40)	NR	Mean: NR Med: 160 Range: 152- 180 SD: NR	NR	IV: 23(6)	Mean: NR Med: 25 Range: NR SD: NR	Creat: NR GFR: 60ml/min/1 .73m ²

Table D2: Population characteristics –CRT P effectiveness (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Cleland,2006 ² CARE HF Sub Study	Arm 1(Medical Therapy Alone):404	F: 109(27) NR	Mean: 66 Med: NR Range: 59- 72 SD: NR	144(36)	NR	Mean: 160 Med: NR Range: 152- 180 SD: NR	NR	III: 377(93)	Mean: NR Med: 25 Range: NR SD: NR	Creat: NR GFR: NR
Cleland,2006 ² CARE HF Sub Study	Arm 2(CRT):409	F: 106(26) NR	Mean: 67 Med: NR Range: 60- 73 SD: NR	165(40)	NR	Mean: 160 Med: NR Range: 152- 180 SD: NR	NR	III: 386(94)	Mean: NR Med: 25 Range: NR SD: NR	Creat: NR GFR: NR
Cleland,2007 ³ CARE HF Sub Study	Arm 1(Medical therapy alone):404	F: 111(27) NR	Mean: 66 Med: NR Range: 59- 72 SD: NR	142(35)	NR	Mean: NR Med: 160 Range: 152- 180 SD: NR	NR	IV: 27(7)	Mean: NR Med: 25 Range: 22- 29 SD: NR	Creat: NR GFR: 61ml/min
Cleland,2007 ³ CARE HF Sub Study	Arm 2(CRT- P):409	F: 105(26) NR	Mean: 67 Med: NR Range: 60- 73 SD: NR	167(41)	NR	Mean: NR Med: 160 Range: 152- 180 SD: NR	NR	IV: 23(6)	Mean: NR Med: 25 Range: 21- 29 SD: NR	Creat: NR GFR: 60ml/min

Table D2: Population characteristics –CRT P effectiveness (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Cleland,2009 ⁴ CARE HF Sub Study	Overall(CRT- P):409	F: 105(26) NR	Mean: 67 Med: NR Range: 60- 73 SD: NR	167(41)	NR	Mean: NR Med: 160 Range: 152- 180 SD: NR	NR	III: NR IV: 23(6)	Mean: NR Med: 25 Range: 21- 29 SD: NR	Creat: NR GFR: 60ml/min
Cleland,2009 ⁴ CARE HF Sub Study	Overall(Medic al therapy alone):404	F: 111(27) NR	Mean: 66 Med: NR Range: 59- 72 SD: NR	142(35)	NR	Mean: NR Med: 160 Range: 152- 180 SD: NR	NR	IV: 27(7)	Mean: NR Med: 25 Range: 22- 29 SD: NR	Creat: NR GFR: 61ml/min
Cleland,2012 ⁵ CARE HF Sub Study	Arm 1(No CRT):404	F: 109(27) NR	Mean: 66 Med: NR Range: 59- 72 SD: NR	144(36)	NR	Mean: 160 Med: NR Range: 152- 180 SD: NR	NR	III: 377(93)	Mean: Med: 25 Range: SD:	Creat: NR GFR: NR
Cleland,2012 ⁵ CARE HF Sub Study	Arm 2(CRT):409	F: 106(26) NR	Mean: 67 Med: NR Range: 60- 73 SD: NR	165(40)	NR	Mean: 160 Med: NR Range: 152- 180 SD: NR	NR	III: 386(94)	Mean: Med: 25 Range: SD:	Creat: NR GFR: NR
Ghio, 2009 ⁶ CARE HF Sub Study	CRT	90(NR)	Mean: 67 Med: NR Range:59- 73 SD: NR	168(46)	NR	Mean: 160 Med: NR Range: 152- 180 SD: NR	NR	IV:(23(6)	Mean: NR Med: NR Range:NR SD:NR	Creat: NR GFR: NR

Table D2: Population characteristics –CRT P effectiveness (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Ghio, 2009 ⁶ CARE HF Sub Study	Medical Therapy	102(NR)	Mean: 66 Med: NR Range: 59- 73 SD: NR	135(36)	NR	Mean: 160 Med: NR Range: 152- 180 SD: NR	NR	IV:(23(6))	Mean: NR Med: NR Range:NR SD:NR	Creat: NR GFR: NR
Kalscheur, 2017 ³⁷ COMPANION Sub Study	Arm 1(No intermittent atrial fibrillation or flutter): 887	F: 337(38) NR	Mean: 65 Med: NR Range: NR SD: 11	470(53)	NR	Mean: 158 Med: NR Range: NR SD: 24	LBBBB: 644(73) RBBB: NR IVCD: NR PBBB: NR	NR	Mean: 23 Med: NR Range: NR SD: 7	Creat: NR GFR: NR
Kalscheur, 2017 ³⁷ COMPANION Sub Study	Arm 2(Prior intermittent atrial fibrillation or flutter): 293	F: 53(18.1) NR	Mean: 69 Med: NR Range: NR SD: 9	195(67)	NR	Mean: 160 Med: NR Range: NR SD: 28	LBBBB: 191(65) RBBB: NR IVCD: NR PBBB: NR	NR	Mean: 22 Med: NR Range: NR SD: 7	Creat: NR GFR: NR
Leclercq,2007 ⁷⁸	Arm 1(BiV First):25	F: 0(0) NR	Mean: 73 Med: NR Range: NR SD: 9.3	14(56)	14(56)	Mean: 212 Med: NR Range: NR SD: 28	NR	NR	Mean: 24 Med: NR Range: NR SD:	Creat: NR GFR: NR
Leclercq,2007 ⁷⁸	Arm 1(BiV First):25	F: 0(0) NR	Mean: 73 Med: NR Range: NR SD: 9.3	14(56)	14(56)	Mean: 212 Med: NR Range: NR SD: 28	NR	NR	Mean: 24 Med: NR Range: NR SD:	Creat: NR GFR: NR

Table D2: Population characteristics –CRT P effectiveness (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Leclercq,2007 ⁷⁸	Arm 1(RV First):19	F: 4(21.1) NR	Mean: 74 Med: NR Range: NR SD: 6	9(47.4)	7(36.8)	Mean: 199 Med: NR Range: NR SD: 21	NR	NR	Mean: 27 Med: NR Range: NR SD:	Creat: NR GFR: NR
Leclercq,2007 ⁷⁸	Arm 1(RV First):19	F: 4(21.1) NR	Mean: 74 Med: NR Range: NR SD: 6	9(47.4)	7(36.8)	Mean: 199 Med: NR Range: NR SD: 21	NR	NR	Mean: 27 Med: NR Range: NR SD:	Creat: NR GFR: NR
Leclercq,2007 ⁷⁸	Overall(All Patients):44	F: 4(9.1) NR	Mean: 73 Med: NR Range: NR SD: 8	23(52.3)	21(47.7)	Mean: 206 Med: NR Range: NR SD: 26	NR	NR	Mean: 25 Med: NR Range: NR SD:	Creat: NR GFR: NR
Leclercq,2007 ⁷⁸	Overall(All Patients):44	F: 4(9.1) NR	Mean: 73 Med: NR Range: NR SD: 8	23(52.3)	21(47.7)	Mean: 206 Med: NR Range: NR SD: 26	NR	NR	Mean: 25 Med: NR Range: NR SD:	Creat: NR GFR: NR
Sutton,2003 ³³ MIRACLE Sub Study	Arm 1(Control group):151	F: 47(31.1) W:136(90.1)) AA:NR O:NR	Mean: 64.8 Med: NR Range: NR SD: 11.4	NR	NR	Mean: 164.7 Med: NR Range: NR SD: 20.6	NR	III: 143(94.7)	Mean: 24.3 Med: NR Range: NR SD: 6.8	Creat: NR GFR: NR
Sutton,2003 ³³ MIRACLE Sub Study	Arm 2(CRT group(CRT- P)):172	F: 60(34.9) W:155(90.1)) AA:NR O:NR	Mean: 63.9 Med: NR Range: NR SD: 11	NR	NR	Mean: 166.4 Med: NR Range: NR SD: 19.7	NR	III: 155(90.1)	Mean: 24.5 Med: NR Range: NR SD: 6.8	Creat: NR GFR: NR

Table D2: Population characteristics –CRT P effectiveness (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Wikstrom,2009 ⁸ CARE HF Sub Study	CRT-P	105(26)	Mean: 67 Med: NR Range: NR SD: NR	167(41)	NR	Mean: 160 Med: NR Range: 152-180 SD: NR	NR	IV:(23(6))	Mean: NR Med: 25 Range:21-29 SD:NR	Creat: NR GFR:60ml/min
Wikstrom,2009 ⁸ CARE HF Sub Study	Medical therapy alone	111(27)	Mean: 66 Med: NR Range: NR SD: NR	142(35)	NR	Mean: 160 Med: NR Range: 152-180 SD: NR	NR	IV:27(7)	Mean: NR Med: 25 Range:22-29 SD:NR	Creat: NR GFR: 61ml/min

F-Female, W-White, AA-African American, O-Others, NR-Not Reported, SD-Standard Deviation, Med-Median, n-Number, LBBB-Left Bundle Branch Block, RBBB-Right, Bundle Branch Block, IVCD-Intra Ventricular Conduction Delay, PBBBlock-Paced Bundle Branch Block, NYHA-New York Heart Association, LVEF-Left Ventricular Ejection Fraction, GFR-Glomerular Filtration Rate

Table D3: Population characteristics –CRT P harms

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Bristow,2004 ³⁴ COMPANION	Arm 1(Optimal Pharmacologic al Therapy):308	F: 96(31) NR	Mean: 68 Med: NR Range: NR SD: NR	NR(59)	NR	Mean: 158 Med: NR Range: NR SD: NR	LBBB:NR(70) RBBB: NR(9) IVCD: NR PBBBlock: NR	III: NR(82)	Mean: 22 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Bristow,2004 ³⁴ COMPANION	Arm 2(CRT-P):617	F: 203(33) NR	Mean: 67 Med: NR Range: NR SD: NR	NR(54)	NR	Mean: 160 Med: NR Range: NR SD: NR	LBBB:NR(69) RBBB:NR(12) IVCD: NR PBBBlock: NR	III: NR(87)	Mean: 20 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Bristow,2004 ³⁴ COMPANION	Arm 3(CRT-D):595	F: 196(33) NR	Mean: 66 Med: NR Range: NR SD: NR	NR(55)	NR	Mean: 160 Med: NR Range: NR SD: NR	LBBB:NR(73) RBBB:NR(10) IVCD: NR PBBBlock: NR	III: NR(86)	Mean: 22 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Cleland,2004 ¹ CARE HF	Arm 1(Medical Therapy Alone):404	F: 111(27) NR	Mean: NR Med: 66 Range: NR SD: NR	144(36)	NR	Mean: NR Med: 160 Range: 152-180 SD: NR	LBBB :NR RBBB: NR IVCD: NR PBBBlock: NR	IV: 27(7)	Mean: NR Med: 25 Range: NR SD: NR	Creat: NR GFR: 61ml/min/1.73m ²
Cleland,2004 ¹ CARE HF	Arm 2(Medical Therapy plus Cardiac Resynchronization (CRT-P)):409	F: 105(26) NR	Mean: NR Med: 67 Range: NR SD: NR	165(40)	NR	Mean: NR Med: 160 Range: 152-180 SD: NR	LBBB :NR RBBB: NR IVCD: NR PBBBlock: NR	IV: 23(6)	Mean: NR Med: 25 Range: NR SD: NR	Creat: NR GFR: 60ml/min/1.73m ²

Table D3: Population characteristics –CRT P harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Cleland,2009 ⁴ CARE HF Sub Study	Overall(CRT-P):409	F: 105(26) NR	Mean: 67 Med: NR Range: 60-73 SD: NR	167(41)	NR	Mean: NR Med: 160 Range: 152-180 SD: NR	LBBB :NR RBBB: NR IVCD: NR PBBBlock: NR	IV: 23(6)	Mean: NR Med: 25 Range: 21-29 SD:	Creat: NR GFR: 60ml/min
Cleland,2009 ⁴ CARE HF Sub Study	Overall(Medical therapy alone):404	F: 111(27) NR	Mean: 66 Med: NR Range: 59-72 SD: NR	142(35)	NR	Mean: NR Med: 160 Range: 152-180 SD: NR	LBBB :NR RBBB: NR IVCD: NR PBBBlock: NR	IV: 27(7)	Mean: NR Med: 25 Range: 22-29 SD:	Creat: NR GFR: 61ml/min
Cock, 2003 ⁵²	Overall:7	F: 2(28.6) NR	Mean: 62 Med: Range: 43-79 SD: 12	NR	NR	Mean: NR Med: NR Range: NR SD: NR	LBBB :NR RBBB: NR IVCD: NR PBBBlock: NR	NR	Mean: NR Med: NR Range: NR SD:	Creat: NR GFR: NR
Garikipati,2014 ⁶⁰	Overall(Overall):21	F: NR NR	Mean: 68.3 Med: 67 Range: 52-85 SD: NR	10(47.6)	NR	Mean: 159.5 Med: NR Range: 132-184 SD: NR	LBBB :NR RBBB: NR IVCD: NR PBBBlock: NR	NR	Mean: NR Med: NR Range: NR SD:	Creat: NR GFR: NR
Gras,2002 ⁶³	Overall:103	F: 22(21.4) NR	Mean: 67 Med: NR Range: NR SD: 10	49(47.6)	NR	Mean: 178 Med: NR Range: NR SD: 28	LBBB :NR RBBB: NR IVCD: NR PBBBlock: NR	III: 70(68) IV: 33(32)	Mean: 22 Med: NR Range: NR SD: 6	Creat: NR GFR: NR

Table D3: Population characteristics –CRT P harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Gras,2007 ⁷ CARE HF Sub Study	Overall(CRT-P):409	F: 105(26) NR	Mean: 67 Med: NR Range: 60-73 SD: NR	167(41)	NR	Mean: NR Med: 160 Range: 152-180 SD: NR	LBBB :NR RBBB: NR IVCD: NR PBBBlock: NR	IV: 23(6)	Mean: NR Med: 25 Range: 21-29 SD:	Creat: NR GFR: 60ml/min
Gras,2007 ⁷ CARE HF Sub Study	Overall(Medic al therapy alone):404	F: 111(27) NR	Mean: 66 Med: NR Range: 59-72 SD: NR	142(35)	NR	Mean: NR Med: 160 Range: 152-180 SD: NR	LBBB :NR RBBB: NR IVCD: NR PBBBlock: NR	IV: 27(7)	Mean: NR Med: 25 Range: 22-29 SD:	Creat: NR GFR: 61ml/min
Hong-xia,2006 ⁶⁷	Overall:117	F: 31(26.5) NR	Mean: 53 Med: NR Range: NR SD: NR	NR	NR	Mean: NR Med: NR Range: NR SD: NR	LBBB :NR RBBB: NR IVCD: NR PBBBlock: NR	NR	Mean: NR Med: NR Range: NR SD:	Creat: NR GFR: NR
Krahn,2002 ⁷³	Overall:45	F: 8(18) NR	Mean: 65.3 Med: NR Range: NR SD: 10.3	31(69)	15(33)	Mean: 166 Med: NR Range: NR SD: 20	LBBB :NR RBBB: NR IVCD: NR PBBBlock: NR	II: 3(7) III: 34(76) IV: 8(18)	Mean: 19 Med: NR Range: NR SD: 5	Creat: NR GFR: NR
Mortensen,2004 ⁸⁴	Overall:189	F: 52(27.5) NR	Mean: 66.3 Med: NR Range: NR SD: 10.6	79(41.8)	NR	Mean: 176.3 Med: NR Range: NR SD: 27	LBBB :NR RBBB: NR IVCD: NR PBBBlock: NR	II: 33(17.5) III: 129(68.3) IV: 27(14.3)	Mean: 24.4 Med: NR Range: NR SD: 6.9	Creat: NR GFR: NR
Stahlberg,2005 ⁹⁵	Overall:40	F: 2(5) NR	Mean: 65 Med: NR Range: NR SD: 10	26(65)	12(30)	Mean: 173 Med: NR Range: NR SD: 22	LBBB :NR RBBB: NR IVCD: NR PBBBlock: NR	III: 35(87.5) IV: 5(12.5)	Mean: 23 Med: NR Range: NR SD: 9	Creat: NR GFR: NR

F-Female, W-White, AA-African American, O-Others, NR-Not Reported, SD-Standard Deviation, Med-Median, n-Number, LBBB-Left Bundle Branch Block, RBBB-Right, Bundle Branch Block, IVCD-Intra Ventricular Conduction Delay, PBBBlock-Paced Bundle Branch Block, NYHA-New York Heart Association, LVEF-Left Ventricular Ejection Fraction, GFR-Glomerular Filtration Rate

Table D4: Population characteristics –CRT D effectiveness

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Abraham,2004 ⁴ MIRACLE ICD II	Arm 1(Control):101	F: 10(9.9) NR	Mean: 63.1 Med: NR Range: NR SD: 12.1	59(58.4)	NR	Mean: 165 Med: NR Range: NR SD: 23	LBBB :NR RBBB: 21(20.8) IVCD: NR PBBBlock: NR	II: 101(100)	Mean: 24.6 Med: NR Range: NR SD: 6.7	Creat: NR GFR: NR
Abraham,2004 ⁴ MIRACLE ICD II	Arm 2(CRT):85	F: 10(11.8) NR	Mean: 63 Med: NR Range: NR SD: 12.8	47(56.3)	NR	Mean: 166 Med: NR Range: NR SD: 25	LBBB :NR RBBB: 10(11.8) IVCD: NR PBBBlock: NR	II: 85(100)	Mean: 24.4 Med: NR Range: NR SD: 6.6	Creat: NR GFR: NR
Arshad,2011 ¹⁰ MADIT CRT Sub Study	Arm 1(ICD):731	F: 178(24.4) W:657/724(90.7) AA:56/724(7.7) O:11/724(1 .5)	Mean: 64 Med: NR Range: NR SD: 11	401(54.9)	90/717(12. 6)	Mean: NR Med: NR Range: NR SD: NR	LBBB :520/729(71.3) RBBB: 92/729(12.6) IVCD: NR PBBBlock: NR	NR	Mean: 24 Med: NR Range: NR SD: NR	Creat: 1.2mg/dl GFR: NR
Arshad,2011 ¹⁰ MADIT CRT Sub Study	Arm 2(CRT- D):1089	F: 275(25.3) W:979/108 3(90.4) AA:87/1083 (8) O:17/1083(1.6)	Mean: 65 Med: NR Range: NR SD: 11	598(55)	118/1063(1 1.1)	Mean: NR Med: NR Range: NR SD: NR	LBBB :761/1088(69. 9) RBBB: 136/1088(12. 5) IVCD: NR PBBBlock: NR	NR	Mean: 24 Med: NR Range: NR SD: NR	Creat: 1.2mg/dl GFR: NR

Table D4: Population characteristics –CRT D effectiveness (continued)

Author, Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Barsheshet, 2011 ¹¹ MADIT CRT Sub Study	Arm 1(ICD):731	F: 178(24.4) W:657/724(90.7) AA:56/724(7.7) O:11/724(1.5)	Mean: 64 Med: NR Range: NR SD: 11	401(54.9)	90/717(12.6)	Mean: NR Med: NR Range: NR SD: NR	LBBB :520/729(71.3) RBBB: 92/729(12.6) IVCD: NR PBBBlock: NR	NR	Mean: 24 Med: NR Range: NR SD: NR	Creat: 1.2mg/dl GFR: NR
Barsheshet, 2011 ¹¹ MADIT CRT Sub Study	Arm 2(CRT-D):1089	F: 275(25.3) W:979/1083(90.4) AA:87/1083(8) O:17/1083(1.6)	Mean: 65 Med: NR Range: NR SD: 11	598(55)	118/1063(11.1)	Mean: NR Med: NR Range: NR SD: NR	LBBB :761/1088(69.9) RBBB: 136/1088(12.5) IVCD: NR PBBBlock: NR	NR	Mean: 24 Med: NR Range: NR SD: NR	Creat: 1.2mg/dl GFR: NR
Birnie, 2013 ²⁶ RAFT Sub Study	Arm 1(ICD):904	F: 172(19) NR	Mean: 66.2 Med: Range: SD: 9.4	587(64.9)	115(12.7)	Mean: 158.3 Med: NR Range: NR SD: 24	LBBB :643(71.1) RBBB: 93(10.3) IVCD: 101(11.2) PBBBlock: 67(7.4)	II: 730(80.8) III: 174(19.2)	Mean: 22.6 Med: NR Range: NR SD: 5.1	Creat: NR GFR: 60.8ML/MI N/1.73M2
Birnie, 2013 ²⁶ RAFT Sub Study	Arm 2(ICD-CRT):894	F: 136(13.2) NR	Mean: 66.1 Med: Range: SD: 9.3	614(68.7)	114(12.8)	Mean: 157 Med: NR Range: NR SD: 23.6	LBBB :652(72.9) RBBB: 68(7.6) IVCD: 106(11.9) PBBBlock: 68(7.6)	II: 708(79.2) III: 186(20.8)	Mean: 22.6 Med: NR Range: NR SD: 5.4	Creat: NR GFR: 59.5ML/MI N/1.73M2

Table D4: Population characteristics –CRT D effectiveness (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBblock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Biton, 2015 ¹² MADIT Sub Study	Arm 1(Men): 887	F: 0(0) W: NR AA: 49(6) O: NR	Mean: 64.2 Med: NR Range: NR SD: 11	476(54)	114(13)	Mean: 164.6 Med: NR Range: NR SD: 19.9	LBBBB: NR RBBB: NR IVCD: NR PBBB: NR	NR	Mean: 28.4 Med: NR Range: NR SD: 3.4	Creat: 1.20 (SD 0.31)mg/dl GFR: NR
Biton, 2015 ¹² MADIT Sub Study	Arm 2(Women): 394	F: 394(100) W: NR AA: 44(11) O: NR	Mean: 64.2 Med: NR Range: NR SD: 10.6	87(22)	27(7)	Mean: 159.5 Med: NR Range: NR SD: 17.3	LBBBB: NR RBBB: NR IVCD: NR PBBB: NR	NR	Mean: 29.4 Med: NR Range: NR SD: 3.4	Creat: 0.99 (SD 0.27)mg/dl GFR: NR
Biton, 2016 ¹³ MADIT Sub Study	Arm 1(ICD (QRS <150msec)): 139	F: 16(12) W: 122(90) AA: NR O: NR	Mean: NR Med: 65 Range: 58 to 72 SD: NR	115(83)	15(11)	Mean: NR Med: 137 Range: 131 to 140 SD: NR	LBBBB: NR RBBB: 50(36) IVCD: NR PBBB: NR	NR	Mean: NR Med: 30 Range: 28 to 32 SD: NR	Creatinine ≥1.4 mg/dl: 37 (27%) GFR: NR
Biton, 2016 ¹³ MADIT Sub Study	Arm 2(CRT-D (QRS <150msec)): 204	F: 24(12) W: 180(89) AA: NR O: NR	Mean: NR Med: 66.5 Range: 59 to 73 SD: NR	162(79)	22(11)	Mean: NR Med: 138 Range: 130 to 142 SD: NR	LBBBB: NR RBBB: 55(27) IVCD: NR PBBB: NR	NR	Mean: NR Med: 30 Range: 28 to 32 SD: NR	Creatinine ≥1.4 mg/dl: 42 (21%) GFR: NR
Biton, 2016 ¹³ MADIT Sub Study	Arm 3(ICD (QRS ≥150msec)): 70	F: 7(10) W: 60(86) AA: NR O: NR	Mean: NR Med: 63 Range: 55 to 71 SD: NR	54(77)	6(9)	Mean: NR Med: 160 Range: 154 to 166 SD: NR	LBBBB: NR RBBB: 42(60) IVCD: NR PBBB: NR	NR	Mean: NR Med: 29 Range: 28 to 31 SD: NR	Creatinine ≥1.4 mg/dl: 15 (21%) GFR: NR

Table D4: Population characteristics –CRT D effectiveness (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Biton, 2016 ¹³ MADIT Sub Study	Arm 4(CRT-D (QRS ≥150msec)): 124	F: 12(10) W: 107(86) AA: NR O: NR	Mean: NR Med: 66 Range: 60 to 73 SD: NR	104(84)	25(20)	Mean: NR Med: 160 Range: 154 to 170 SD: NR	LBBBB: NR RBBB: 81(65) IVCD: NR PBBB: NR	NR	Mean: NR Med: 30 Range: 28 to 31 SD: NR	Creatinine ≥1.4 mg/dl: 37 (30%) GFR: NR
Diab, 2011 ⁵⁴	Arm 1(CRT- D):27	F: 6(22.2) NR	Mean: 65 Med: NR Range: NR SD: 8	15	NR	Mean: 159 Med: NR Range: NR SD: 17	NR	II: NR(25) III: 92.6	Mean: 22 Med: NR Range: NR SD: 7	Creat: NR GFR: NR
Diab, 2011 ⁵⁴	Arm 2(Mechanical dyssynchrony absent based on echo/TDI criteria):46	F: 5(10.9) NR	Mean: 66 Med: NR Range: NR SD: 11	36	NR	Mean: 138 Med: NR Range: NR SD: 18	NR	II: NR(41) III: 89.1	Mean: 26 Med: NR Range: NR SD: 5	Creat: NR GFR: NR
Diab, 2011 ⁵⁴	Arm 3(CRT-D from mechanical dyssynchrony absent based on echo/TDI criteria):24	F: 3(12.5) NR	Mean: 67 Med: NR Range: NR SD: 7	17	NR	Mean: 134 Med: NR Range: NR SD: 15	NR	II: NR(21) III: 87.5	Mean: 25 Med: NR Range: NR SD: 5	Creat: NR GFR:NR
Diab, 2011 ⁵⁴	Arm 4(ICD from mechanical dyssynchrony absent based on echo/TDI criteria):22	F: 2(9.1) NR	Mean: 65 Med: NR Range: NR SD: 13	16	NR	Mean: 142 Med: NR Range: NR SD: 20	LBBB :NR RBBB: NR IVCD: NR PBBBlock: NR	II: NR(17) III: 77.3	Mean: 27 Med: NR Range: NR SD: 6	Creat: NR GFR: NR

Table D4: Population characteristics –CRT D effectiveness (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Goldenberg, 2014 ¹⁵	Arm 1(ICD): 327	F: 72(23) NR	Mean: NR Med: NR Range: NR SD: NR	166(51)	NR	NR	NR	I: 51(16)	NR	Creat: NR GFR: NR
Goldenberg, 2014 ¹⁵	Arm 2(CRTD): 327	F: 128(24) NR	Mean: NR Med: NR Range: NR SD: NR	279(53)	NR	NR	NR	I: 73(14)	NR	Creat: NR GFR: NR
Healey,2012 ²⁹ RAFT Sub Study	Arm 1(ICD):115	F: NR(14.8) NR	Mean: 71.6 Med: NR Range: NR SD: 7.3	NR	115(100)	Mean: 151 Med: NR Range: NR SD: 23.6	NR	II: NR(74.8)	Mean: 22.9 Med: NR Range: NR SD: 5.3	Creat: 117 µmol/L GFR: NR
Healey,2012 ²⁹ RAFT Sub Study	Arm 2(CRT- ICD):114	F: NR(9.6) NR	Mean: 70.4 Med: NR Range: NR SD: 7.7	NR	114(100)	Mean: 153.4 Med: NR Range: NR SD: 24.7	NR	II: NR(69.3)	Mean: 22.3 Med: NR Range: NR SD: 5.1	Creat: 132 µmol/L GFR: NR
Higgins,2003 ⁶⁵	Arm 1(CRT):245	F: 37(15) NR	Mean: 66 Med: NR Range: NR SD: 11	NR(67)	NR	Mean: 160 Med: NR Range: NR SD: 27	LBBB :NR(54) RBBB: NR(14) IVCD: NR(32) PBBBlock: NR	II: NR(32) III: NR(60) IV: NR(8)	Mean: 21 Med: NR Range: NR SD: 6	Creat: NR GFR: NR

Table D4: Population characteristics –CRT D effectiveness (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Higgins,2003 ⁶⁵	Arm 2(No CRT):245	F: 42(17) NR	Mean: 66 Med: NR Range: NR SD: 11	NR(71)	NR	Mean: 156 Med: NR Range: NR SD: 26	LBBB :NR(55) RBBB: NR(12) IVCD: NR(33) PBBlock: NR	II: NR(33) III: NR(57) IV: NR(10)	Mean: 21 Med: NR Range: NR SD: 6	Creat: NR GFR: NR
Lozano,2000 ⁸²	Arm 1(BV Pacing):109	F: NR	Mean: NR Med: NR Range: NR SD: NR	NR	NR	Mean: NR Med: NR Range: NR SD: NR	NR	NR	Mean: Med: Range: SD:	Creat: NR GFR: NR
Lozano,2000 ⁸²	Arm 2(No Pacing):113	F: NR	Mean: NR Med: NR Range: NR SD: NR	NR	NR	Mean: NR Med: NR Range: NR SD: NR	NR	NR	Mean: Med: Range: SD:	Creat: NR GFR: NR
Lozano,2000 ⁸²	Overall(Total): 222	F: 38(17) NR	Mean: 65 Med: NR Range: NR SD: 10	71(32)	NR	Mean: NR Med: NR Range: NR SD: NR	NR	II: 78(35) III: 127(57) IV: 18(8)	Mean: 22 Med: Range: SD: 7	Creat: NR GFR: NR
Moss,2009 ⁹ MADIT CRT	Arm 1(ICD):731	F: 178(24.4) W:657/724(90.7) AA:56/724(7.7) O:11/724(1 .5)	Mean: 64 Med: NR Range: NR SD: 11	401(54.9)	90/717(12. 6)	Mean: NR Med: NR Range: NR SD: NR	LBBB :520/729(71.3) RBBB: 92/729(12.6) IVCD: NR PBBlock: NR	NR	Mean: 24 Med: NR Range: NR SD: 5	Creat: 1.2mg/dl GFR: NR

Table D4: Population characteristics –CRT D effectiveness (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Moss,2009 ⁹ MADIT CRT	Arm 2(CRT- D):1089	F: 275(25.3) W:979/108 3(90.4) AA:87/1083 (8) O:17/1083(1.6)	Mean: 65 Med: NR Range: NR SD: 11	598(55)	118/1063(1 1.1)	Mean: NR Med: NR Range: NR SD: NR	LBBB :761/1088(69. 9) RBBB: 136/1088(12. 5) IVCD: NR PBBBlock: NR	NR	Mean: 24 Med: NR Range: NR SD: 5	Creat: 1.2mg/dl GFR: NR
Pinter,2009 ⁸⁸	Arm 1(CRT ON):36	F: 8(22.2) NR	Mean: 66.3 Med: NR Range: NR SD: 8.6	NR	6(16.7)	Mean: NR Med: NR Range: NR SD: NR	LBBB :NR RBBB: NR IVCD: NR PBBBlock: NR	NR	Mean: 24.2 (MUGA) 21.2 (ECHO) Med: NR Range: NR SD: 7.5	Creat: 121numol/ L GFR: NR
Pinter,2009 ⁸⁸	Arm 2(CRT OFF):36	F: 7(19.4) NR	Mean: 66.1 Med: NR Range: NR SD: 8.8	NR	2(5.6)	Mean: NR Med: NR Range: NR SD: NR	NR	NR	Mean: 26.8 (MUGA) 24 (ECHO) Med: NR Range: NR SD: 8.4	Creat: 114numol/ L GFR: NR
Solomon,2010 ²¹ MADIT CRT Sub Study	Arm 1(ICD):623	F: 154(24.7) W:567(91) O:Non White 56(9)	Mean: 64.3 Med: NR Range: NR SD: 10.7	334(53.6)	NR	Mean: 159.3 Med: NR Range: NR SD: 20.4	LBBB :444(71.2) RBBB: 79(12.7) IVCD: NR PBBBlock: NR	II: 523(83.9)	Mean: NR Med: NR Range: NR SD: NR	Creat: NR GFR: 68.8ml/min /1.73m ²

Table D4: Population characteristics –CRT D effectiveness (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Solomon,2010 ²¹ MADIT CRT Sub Study	Arm 2(CRT- D):749	F: 184(24.6) W:684(91.3) O:Non White 65(8.7)	Mean: 64.4 Med: NR Range: NR SD: 10.8	411(54.9)	NR	Mean: 158.6 Med: NR Range: NR SD: 19.5	LBBB :532(71) RBBB: 83(11.1) IVCD: NR PBBBlock: NR	II: 640(85.4)	Mean: NR Med: NR Range: NR SD: NR	Creat: NR GFR: 69.4ml/min /1.73m ²
Stockburger, 2016 ²² MADIT study MADIT Sub Study	Arm 1(ICD, long PR (≥230ms)): 36	F: 1(3) NR	Mean: 66.5 Med: NR Range: NR SD: 10.1	NR	6(17)	Mean: 145.8 Med: NR Range: NR SD: 13.5	LBBBB: NR RBBB: 13(36) IVCD: 23(64) PBBB: NR	I: 14(39); II: NR;III: NR; IV: NR	Mean: 29.7 Med: NR Range: NR SD: 3.5	Creat: NR GFR: 63.1ml
Stockburger, 2016 ²² MADIT study MADIT Sub Study	Arm 2(ICD, normal PR (<230ms)): 171	F: 22(13) NR	Mean: 63.6 Med: NR Range: NR SD: 10.1	NR	15(9)	Mean: 145.5 Med: NR Range: NR SD: 14.4	LBBBB: NR RBBB: 79(46) IVCD: 92(54) PBBB: NR	I: 38(22); II: NR;III: NR; IV: NR	Mean: 29.7 Med: NR Range: NR SD: 3	Creat: NR GFR: 70ml
Stockburger, 2016 ²² MADIT study MADIT Sub Study	Arm 3(CRT-D, long PR (≥230ms)): 60	F: 4(7) NR	Mean: 68.5 Med: NR Range: NR SD: 9.9	NR	15(26)	Mean: 148.1 Med: NR Range: NR SD: 14.9	LBBBB: NR RBBB: 26(43) IVCD: 34(57) PBBB: NR	I: 13(22); II: NR;III: NR; IV: NR	Mean: 30 Med: NR Range: NR SD: 2.7	Creat: NR GFR: 62.3ml

Table D4: Population characteristics –CRT D effectiveness (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Stockburger, 2016 ²² MADIT study MADIT Sub Study	Arm 4(CRT-D, normal PR (<230ms)): 267	F: 32(12) NR	Mean: 64.6 Med: NR Range: NR SD: 10.6	NR	31(12)	Mean: 146.7 Med: NR Range: NR SD: 16.6	LBBBB: NR RBBB: 109(41) IVCD: 157(59) PBBB: NR	I: 56(21); II: NR;III: NR; IV: NR	Mean: 29.7 Med: NR Range: NR SD: 3.4	Creat: NR GFR: 70.1ml
Tang,2010 ²⁵ RAFT	Arm 1(ICD):904	F: 172(19) NR	Mean: 66.2 Med: NR Range: NR SD: 9.4	587(64.9)	115(12.7)	Mean: 158.3 Med: NR Range: NR SD: 24	LBBB :643(71.1) RBBB: 93(10.3) IVCD: 101(11.2) PBBBlock: 67(7.4)	II: 730(80.8) III: 174(19.2)	Mean: 22.6 Med: NR Range: NR SD: 5.1	Creat: NR GFR: NR
Tang,2010 ²⁵ RAFT	Arm 2(ICD- CRT):894	F: 136(13.2) NR	Mean: 66.1 Med: NR Range: NR SD: 9.3	614(68.7)	114(12.8)	Mean: 157 Med: NR Range: NR SD: 23.6	LBBB :652(72.9) RBBB: 68(7.6) IVCD: 106(11.9) PBBBlock: 68(7.6)	II: 708(79.2) III: 186(20.8)	Mean: 22.6 Med: NR Range: NR SD: 5.4	Creat: NR GFR: NR
Tompkins, 2013 ²³ MADIT CRT Sub Study	Arm 1(ICD):87	F: 6(7) NR	Mean: 64.3 Med: NR Range: NR SD: 9.7	74(85)	NR	Mean: 150.5 Med: NR Range: NR SD: 13.8	LBBB :NA(NA) RBBB: 87(100) IVCD: NR PBBBlock: NR	I: 20(23)	Mean: 25 Med: NR Range: NR SD: 5	Creat: 1.3mg/dl GFR: NR

Table D4: Population characteristics –CRT D effectiveness (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Tompkins, 2013 ²³ MADIT CRT Sub Study	Arm 2(CRT-D LAFB):80	F: 7(9) NR	Mean: 68.2 Med: NR Range: NR SD: 9.9	69(86)	NR	Mean: 155.2 Med: NR Range: NR SD: 15.7	LBBB :NA(NA) RBBB: 80(100) IVCD: NR PBBBlock: NR	I: 17(21)	Mean: 25 Med: NR Range: NR SD: 5	Creat: 1.25mg/dl GFR: NR
Tompkins, 2013 ²³ MADIT CRT Sub Study	Arm 3(CRT-D non-LAFB):52	F: 5(10) NR	Mean: 63.5 Med: NR Range: NR SD: 11.3	47(90)	NR	Mean: 152.5 Med: NR Range: NR SD: 14	LBBB :NA(NA) RBBB: 52(100) IVCD: NR PBBBlock: NR	I: 9(17)	Mean: 26 Med: NR Range: NR SD: 5	Creat: 1.29mg/dl GFR: NR
Young,2003 ³¹ MIRACLE ICD	Arm 1(Control):182	F: 41(22.5) NR	Mean: 67.6 Med: NR Range: NR SD: 9.2	138(75.8)	NR	Mean: 162 Med: NR Range: NR SD: 22	LBBB :NR RBBB: 24(13) IVCD: NR PBBBlock: NR	III: 163(89.6) IV: 19(10.4)	Mean: 23.9 Med: NR Range: NR SD: 6	Creat: NR GFR:NR
Young,2003 ³¹ MIRACLE ICD	Arm 2(CRT):187	F: 45(24.1) NR	Mean: 66.6 Med: NR Range: NR SD: 11.3	119(64)	NR	Mean: 165 Med: NR Range: NR SD: 22	LBBB :NR RBBB: 25(13) IVCD: NR PBBBlock: NR	III: 165(88.2) IV: 22(11.8)	Mean: 24.2 Med: NR Range: NR SD: 6.5	Creat: NR GFR: NR

Table D4: Population characteristics –CRT D effectiveness (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Zareba,2011 ²⁴ MADIT CRT Sub Study	Arm 1(ICD):731	F: 178(24.4) W:657/724(90.7) AA:56/724(7.7) O:11/724(1 .5)	Mean: 64 Med: NR Range: NR SD: 11	401(54.9)	90/717(12. 6)	Mean: NR Med: NR Range: NR SD: NR	LBBB :520/729(71.3) RBBB: 92/729(12.6) IVCD: NR PBBBlock: NR	NR	Mean: 24 Med: NR Range: NR SD: NR	Creat: 1.2mg/dl GFR: NR
Zareba,2011 ²⁴ MADIT CRT Sub Study	Arm 2(CRT- D):1089	F: 275(25.3) W:979/108 3(90.4) AA:87/1083 (8) O:17/1083(1.6)	Mean: 65 Med: NR Range: NR SD: 11	598(55)	118/1063(1 1.1)	Mean: NR Med: NR Range: NR SD: NR	LBBB :761/1088(69. 9) RBBB: 136/1088(12. 5) IVCD: NR PBBBlock: NR	NR	Mean: 24 Med: NR Range: NR SD: NR	Creat: 1.2mg/dl GFR: NR

F-Female, W-White, AA-African American, O-Others, NR-Not Reported, SD-Standard Deviation, Med-Median, n-Number, LBBB-Left Bundle Branch Block, RBBB-Right, Bundle Branch Block, IVCD-Intra Ventricular Conduction Delay, PBBBlock-Paced Bundle Branch Block, NYHA-New York Heart Association, LVEF-Left Ventricular Ejection Fraction, GFR-Glomerular Filtration Rate

Table D5: Population characteristics –CRT D harms

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Abraham,2004 ⁴ 1	Arm 1(Control):101	F: 10(9.9) O:NR(59)	Mean: 63.1 Med: NR Range: NR SD: 12.1	59(58.4)	NR	Mean: 165 Med: NR Range: NR SD: 23	LBBB :NR RBBB: 21(20.8) IVCD: NR PBBBlock: NR	II: 101(100)	Mean: 24.6 Med: NR Range: NR SD: 6.7	Creat: NR GFR: NR
Abraham,2004 ⁴ 1	Arm 2(CRT):85	F: 10(11.8) O:NR(47)	Mean: 63 Med: NR Range: NR SD: 12.8	47(56.3)	NR	Mean: 166 Med: NR Range: NR SD: 25	LBBB :NR RBBB: 10(11.8) IVCD: NR PBBBlock: NR	II: 85(100)	Mean: 24.4 Med: NR Range: NR SD: 6.6	Creat: NR GFR: NR
Adelstein, 2016 ⁴³	Arm 1(CRT-D ≥80 years old): 258	F: 69(26.7) NR	Mean: 82.9 Med: NR Range: NR SD: 2.5	183(70.9)	72(27.9)	Mean: NR Med: 172 Range: iqr 156 to 188 SD: NR	LBBB: 123(47.7) RBBB: 37(14.3) IVCD: 29(11.2) PBBBlock: 69(26.7)	I: 0(0); II: 17(6.6); III: 236(91.5); IV: 5(1.9)	Mean: 24.4 Med: NR Range: NR SD: 6.9	Creat: NR GFR: Median 51.6
Adelstein, 2016 ⁴³	Arm 2(CRT-D <80 years old): 1058	F: 274(25.9) NR	Mean: 64.6 Med: NR Range: NR SD: 10.9	615(58.1)	283(26.7)	Mean: NR Med: 168 Range: IQR 148 to 188 SD: NR	LBBB: 587(55.5) RBBB: 173(16.4) IVCD: 106(10) PBBBlock: 191(18.1)	I: 0(0); II: 75(7.1); III: 904(85.4); IV: 79(7.5)	Mean: 22.7 Med: NR Range: NR SD: 8	Creat: NR GFR: Median 63.0

Table D5: Population characteristics –CRT D harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Auricchio,2014 ⁴	Overall(All patients):521	F: 94(18) NR	Mean: 67.4 Med: NR Range: NR SD: 10.1	NR	107(20.5)	Mean: 155.3 Med: NR Range: NR SD: 26.6	LBBB :349(67) RBBB: 49(9.4) IVCD: 54(10.9) PBBBlock: 40(7.7)	I: 1(0.2) II: 31(6.1) III: 443(85) IV: 34(6.7)	Mean: 25.7 Med: NR Range: NR SD: 7.7	Creat: 1.4mg/dl GFR:
Biton, 2018 ¹⁴	Arm 1(QRST tertile 1 <=0.527): 317	F: 60(19) NR	Mean: 65.9 Med: NR Range: NR SD: 10.1	235(74)	46(15)	Mean: 148.8 Med: NR Range: NR SD: 16.8	LBBB: 149(47) RBBB: NRIVCD: NRPBBBlock: NR	NR	Mean: 29.7 Med: NR Range: NR SD: 3.2	Creat: 1.2 (SD 0.33)mg/dl GFR: 66.6 (SD 18.7)
Biton, 2018 ¹⁴	Arm 2(QRST tertile 2 0.528- 0.766): 318	F: 95(30) NR	Mean: 64.1 Med: NR Range: NR SD: 10.7	156(49)	32(10)	Mean: 157.4 Med: NR Range: NR SD: 17.6	LBBB: 251(79) RBBB: NRIVCD: NRPBBBlock: NR	NR	Mean: 28.9 Med: NR Range: NR SD: 3.3	Creat: 1.14 (SD 0.32)mg/dl GFR: 69.7 (SD 20.1)
Biton, 2018 ¹⁴	Arm 3(QRST tertile 3 >0.766): 317	F: 82(26) NR	Mean: 63.6 Med: NR Range: NR SD: 11.4	127(40)	29(9)	Mean: 166.8 Med: NR Range: NR SD: 18.9	LBBB: 295(93) RBBB: NRIVCD: NRPBBBlock: NR	NR	Mean: 28.7 Med: NR Range: NR SD: 3.4	Creat: 1.12 (SD 0.32)mg/dl GFR: 72.6 (SD 21.9)
Bossard,2014 ⁴⁹	Overall(All patients):49	F: 11(22) O:NR(18)	Mean: 63 Med: NR Range: NR SD: 10	18(27)	NR	Mean: 161 Med: NR Range: NR SD: 26	LBBB :46(94) RBBB: NR IVCD: NR PBBBlock: NR	NR	Mean: NR Med: NR Range: NR SD: NR	Creat: NR GFR: NR

Table D5: Population characteristics –CRT D harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Boven,2013 ⁵⁰	Overall(Total Study Population):54 3	F: 142(26) O:NR(294)	Mean: 64 Med: NR Range: NR SD: 11	294(54)	153(28)	Mean: NR Med: NR Range: NR SD: NR	LBBB :410(82) RBBB: 26(5.2) IVCD: 10(2) PBBlock: 55(10)	I: 21(4.1) II: 178(35) III: 304(60) IV: 8(1.6)	Mean: 24 Med: NR Range: NR SD: 7.4	Creat: 115umol/L GFR: NRNR
Boven,2013 ⁵¹	Arm 1(Functional Nonrespon- ders):100	F: 26(25) NR	Mean: NR Med: 70 Range: NR SD: NR	59(59)	28(28)	Mean: NR Med: NR Range: NR SD: NR	LBBB :61(62) RBBB: 7(7.1) IVCD: 11(11) PBBlock: 16(16)	I: 6(7.5) II: 30(38) III: 40(50) IV: 4(5)	Mean: 20 Med: NR Range: NR SD: NR	Creat: 110 GFR: NR
Boven,2013 ⁵¹	Arm 2(Functional Responders):4 2	F: 16(38) NR	Mean: NR Med: 68 Range: NR SD: NR	16(38)	9(21)	Mean: NR Med: NR Range: NR SD: NR	LBBB :37(93) RBBB: 0(0) IVCD: 1(2.5) PBBlock: 2(5)	I: 9(25) II: 15(42) III: 12(33) IV: 0(0)	Mean: 23 Med: NR Range: NR SD: NR	Creat: 92 GFR: NR
Boven,2013 ⁵¹	Overall(Total): 142	F: 42(30) NR	Mean: NR Med: 69 Range: NR SD: NR	75(53)	37(26)	Mean: NR Med: NR Range: NR SD: NR	LBBB :98(71) RBBB: 7(5.1) IVCD: 12(8.7) PBBlock: 18(13)	I: 15(13) II: 45(39) III: 52(45) IV: 4(3.4)	Mean: 20 Med: NR Range: NR SD: NR	Creat: 105 GFR: NR
Crossley, 2015 ⁵³	Overall(CRT-D (all three lead model combined)): 1124	F: 326(29) W: 832(74) AA: NR O: NR	Mean: 68 Med: NR Range: NR SD: 11	NR	NR	Mean: 156 Med: NR Range: NR SD: 23	LBBB: 809(72) RBBB: NRIVCD: NRPBBlock: NR	I: NR; II: 303(27); III: 764(68); IV: NR	Mean: 0.27 Med: NR Range: NR SD: 0.07	NR

Table D5: Population characteristics –CRT D harms (continued)

Author, Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Duray,2008 ⁵⁶	Overall:79	F: 16(20) NR	Mean: 79 Med: NR Range: 35-83 SD: 11	38(48)	NR	Mean: NR Med: NR Range: NR SD: NR	NR	I: NR(22) II: 28(NR) IV: NR(23NR)	Mean: NR Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Echouffo-Tcheugui, 2016 ⁵⁷	Arm 1(Non-diabetes mellitus): 11345	F: 3815(33.6) W: 10164(89.6) AA: 634(5.6) O: 222(2)	Mean: 75.4 Med: NR Range: NR SD: 6.2	6815(60.1)	3488(30.7)	Mean: NR Med: NR Range: 120 to >=150 SD: NR	LBBB: 8480(74.7) RBBB: NRIVCD: NRPBBBlock: NR	I: 164(1.4); II: 1414(12.5); III: 9377(82.7); IV: 384(3.4)	Mean: 24.2 Med: NR Range: NR SD: 6.3	NR
Echouffo-Tcheugui, 2016 ⁵⁷	Arm 2(Diabetes Mellitus): 7083	F: 2205(31.1) W: 6030(85.1) AA: 572(8.1) O: 178(2.5)	Mean: 74 Med: NR Range: NR SD: 5.8	5123(72.3)	2132(30.1)	Mean: NR Med: NR Range: 120 to >=150 SD: NR	LBBB: 4985(70.4) RBBB: NRIVCD: NRPBBBlock: NR	I: 75(1.1); II: 663(9.4); III: 6049(85.4); IV: 291(4.1)	Mean: 24.4 Med: NR Range: NR SD: 6.2	NR
Essebag, 2015 ²⁷	Overall(ICD substudy upgrade to CRT-D): 60	F: 5(8.3) NR	Mean: 63.5 Med: NR Range: NR SD: 9.3	37(61.7)	8(13.3)	Mean: 159.9 Med: NR Range: NR SD: 24.3	LBBB: 41(68.3) RBBB: 4(6.7) IVCD: 7(11.7) PBBBlock: 8(13.3)	I: NR; II: 51(85); III: NR; IV: NR	Mean: 23.2 Med: NR Range: NR SD: 4.6	NR

Table D5: Population characteristics –CRT D harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Friedman, 2015 ⁵⁹	Arm 1(ICD): 1421	F: 408(28.7) W: 1217(85.6) AA: 113(8) O: 27(1.9)	Mean: 75.9 Med: NR Range: NR SD: 6.1	1101(77.5)	559(39.3)	Mean: nr Med: nr Range: 120- >170 SD: nr	LBBB: 745(52.4) RBBB: NR IVCD: NR PBBlock: NR	I: NR; II: NR; III: 1348(94.9); IV: 73(5.1)	Mean: 0.238 Med: NR Range: NR SD: 0.057	Creat: NR GFR: NR
Friedman, 2015 ⁵⁹	Arm 2(CRT-D): 9525	F: 3296(34.6) W: 8464(88.9) AA: 566(5.9) O: 199(2.1)	Mean: 75.7 Med: NR Range: NR SD: 6.1	6475(68)	3164(33.2)	Mean: nr Med: nr Range: 120- >170 SD: nr	LBBB: 7016(73.7) RBBB: NR IVCD: NR PBBlock: NR	I: NR; II: NR; III: 9046(95); IV: 479(5)	Mean: 23.3 Med: NR Range: NR SD: 5.8	Creat: NR GFR: NR
Gasparini,2009 ⁶ 1	Arm 1(Protect Group(Standar d CRT-D)):164	F: 38(23.2) NR	Mean: 64.2 Med: NR Range: NR SD: 11.7	NR	29(17.7)	Mean: 163 Med: NR Range: NR SD: NR	NR	NR	Mean: 24.6 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Gasparini,2009 ⁶ 1	Arm 2(Control (CRT plus ICD)):160	F: 40(25) NR	Mean: 64.2 Med: NR Range: NR SD: 10.8	NR	23(14.4)	Mean: 160 Med: NR Range: NR SD: NR	NR	NR	Mean: 25.4 Med: NR Range: NR SD: NR	Creat: NR GFR: NR

Table D5: Population characteristics –CRT D harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Gillis,2014 ²⁸ RAFT Sub Study	Arm 1(ICD):904	F: 172(19) O:NR(587)	Mean: 66.2 Med: NR Range: NR SD: 9.4	587(64.9)	115(12.7)	Mean: 158.3 Med: NR Range: NR SD: 24	LBBB :643(71.1) RBBB: 93(10.3) IVCD: 101(11.2) PBBBlock: 67(7.4)	II: 730(80.8) III: 174(19.2)	Mean: NR Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Gillis,2014 ²⁸ RAFT Sub Study	Arm 2(ICD- CRT):894	F: 136(15.2) O:NR(614)	Mean: 66.1 Med: NR Range: NR SD: 9.3	614(68.7)	114(12.8)	Mean: 157 Med: NR Range: NR SD: 23.6	LBBB :652(72.9) RBBB: 68(7.6) IVCD: 106(11.9) PBBBlock: 68(7.6)	II: 708(79.2) III: 186(20.8)	Mean: NR Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Gopalamurugan ,2014 ⁶²	Arm 1(CRT- D):117	F: 37(117)	Mean: 66 Med: NR Range: NR SD: 11	49(42)	NR	Mean: NR Med: NR Range: NR SD: NR	NR	NR	Mean: 24.5 Med: NR Range: NR SD: 8.2	Creat: NR GFR: NR
Gopalamurugan ,2014 ⁶²	Arm 2(ICD):63	F: 10(63)	Mean: 65.3 Med: NR Range: NR SD: 13	38(60)	NR	Mean: NR Med: NR Range: NR SD: NR	NR	NR	Mean: 27.7 Med: NR Range: NR SD: 7.2	Creat: NR GFR: NR
Haugaa,2014 ⁶⁴	Arm 1(Patients without arrhythmia):22 7	F: 62(227)	Mean: 65 Med: NR Range: NR SD: 12	133(59)	NR	Mean: 160 Med: NR Range: NR SD: 28	NR	NR	Mean: 25 Med: NR Range: NR SD: 6	Creat: NRNR GFR: NRNR

Table D5: Population characteristics –CRT D harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Haugaa,2014 ⁶⁴	Arm 2(Patients with arrhythmia):39	F: 6(39)	Mean: 66 Med: NR Range: NR SD: 9	26(67)	NR	Mean: 155 Med: NR Range: NR SD: 26	NR	NR	Mean: 23 Med: NR Range: NR SD: 6	Creat: NR GFR: NR
Higgins,2003 ⁶⁵	Arm 1(CRT):245	F: 37(15) NR	Mean: 66 Med: NR Range: NR SD: 11	NR(67)	NR	Mean: 160 Med: NR Range: NR SD: 27	LBBB :NR(54) RBBB: NR(14) IVCD: NR PBBBlock: NR	II: NR(32) III: NR(60) IV: NR(8)	Mean: NR Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Higgins,2003 ⁶⁵	Arm 2(No CRT):245	F: 42(17) NR	Mean: 66 Med: NR Range: NR SD: 11	NR(71)	NR	Mean: 156 Med: NR Range: NR SD: 26	LBBB :NR(55) RBBB: NR(12) IVCD: NR PBBBlock: NR	II: NR(33) III: NR(57) IV: NR(10)	Mean: NR Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Hoke, 2014 ⁶⁶	Arm 1(Age <75 Y): 590	F: 136(23) NR	Mean: 63 Med: NR Range: NR SD: 10	336(57)	86(15)	Mean: 155 Med: nr Range: nr SD: 33	NR	NR	Mean: 26 Med: NR Range: NR SD: 8	Creat: NR GFR: 76±34mL/ min per 1.73 m2
Hoke, 2014 ⁶⁶	Arm 2(Age ≥75 Y): 208	F: 44(21) NR	Mean: 78 Med: NR Range: NR SD: 3	144(69)	51(26)	Mean: 160 Med: nr Range: nr SD: 30	NR	NR	Mean: 27 Med: NR Range: NR SD: 8	Creat: NR GFR: 51±18mL/ min per 1.73 m2

Table D5: Population characteristics –CRT D harms (continued)

Author, Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Jamerson, 2014 ¹⁷	Arm 1(Males):1346	F: 0(1346)	Mean: 64.6 Med: Range: SD: 10.7	NR	NR	Mean: 158.2 Med: NR Range: NR SD: 20.5	LBBB: 876(65) RBBB: NR IVCD: NR PBBBlock: NR	NR	Mean: 23.9 Med: NR Range: NR SD: 5.2	Creat: 1.22mg/dl GFR: NR
Jamerson, 2014 ¹⁷	Arm 2(Females):444	F: 444(444)	Mean: 63.9 Med: Range: SD: 10.7	NR	NR	Mean: 157.7 Med: NR Range: NR SD: 17.4	LBBB: 388(87) RBBB: NR IVCD: NR PBBBlock: NR	NR	Mean: 23.4 Med: NR Range: NR SD: 5.4	Creat: 1mg/dl GFR: NR
Khazanie, 2016 ⁶⁸	Arm 1(ICD): 2481	F: 485(20) W: 2330(94) AA: 97(4) O: 54(2)	Mean: 75.4 Med: NR Range: NR SD: 6	1826(74)	2481(100)	Mean: 144 Med: NR Range: qrs>=150ms = 884, 36% SD: 22	LBBB: 864(35) RBBB: 551(22) IVCD: 477(19) PBBBlock: NR	I: 114(5); II: 1352(55); III: 974(39); IV: 41(2)	Mean: 25.6 Med: NR Range: <=25% = 1348, 54% SD: 6	Creat: 1.4 (SD 1)mg/dl GFR: NR

Table D5: Population characteristics –CRT D harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Khazanie, 2016 ⁶⁸	Arm 2(CRT-D): 6470	F: 1584(25) W: 6046(93) AA: 268(4) O: 156(2)	Mean: 75.8 Med: NR Range: NR SD: 6	4204(65)	6470(100)	Mean: 151 Med: NR Range: qrs>=150ms = 3286, 51% SD: 21	LBBB: 3919(61) RBBB: 1019(16) IVCD: 776(12) PBBBlock: NR	I: 41(1); II: 625(10); III: 5506(85); IV: 298(5)	Mean: 24.7 Med: NR Range: <=25% = 3935, 61% SD: 6	Creat: 1.4 (SD 1)mg/dl GFR: NR
Killu, 2017 ⁶⁹	Arm 1(Non- super responders): 592	F: 117(20) NR	Mean: 67 Med: NR Range: NR SD: 11.3	NR	NR	Mean: 163 Med: NR Range: NR SD: 34	LBBB: 269(46) RBBB: 51(9) IVCD: 96(16) PBBBlock: 137(23)	NR	Mean: 23.5 Med: NR Range: NR SD: 7.2	Creat: 1.4 SD0.7mg/ dl GFR: NR
Killu, 2017 ⁶⁹	Arm 3(Super responder): 37	F: 18(49) NR	Mean: 67.1 Med: NR Range: NR SD: 12.8	NR	NR	Mean: 166 Med: NR Range: NR SD: 29	LBBB: 21(58) RBBB: 0(0) IVCD: 1(3) PBBBlock: 14(39)	NR	Mean: 27.7 Med: NR Range: NR SD: 7.3	Creat: 1.3 sd 1.1mg/dl GFR: NR
Knight,2004 ⁷¹	Overall:443	F: 75(17) NR	Mean: 66 Med: NR Range: NR SD: 11	NR	98(22)	Mean: 158 Med: NR Range: NR SD: 22	LBBB :253(57) RBBB: 58(13) IVCD: 133(30) PBBBlock: NR	II: 146(33) III: 257(58) IV: 40(9)	Mean: 21 Med: NR Range: NR SD: NR	Creat: NR GFR: NR

Table D5: Population characteristics –CRT D harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Kronborg, 2018 ⁷⁴	Overall: 1643	F: 300(18) NR	Mean: 68 Med: NR Range: NR SD: 10	1075(68)	NR	Mean: 157 Med: NR Range: NR SD: 26	NR	NR	Mean: 23 Med: NR Range: NR SD: 6	NR
Kuhlkamp, 2002 ⁷⁵	Overall	F: 7(9) NR	Mean: 63.8 Med: Range:41- 79 SD: 8.8	NR	5(6)	Mean: NR Med: NR Range: NR SD: NR	NR	I: 26(32) II: 48(59) III: 7(9) IV: NR	Mean: 25 Med: NR Range: NR SD: 7	Creat: NR GFR: NR
Landolina,2011 ⁷⁷	Overall:3253	F: 650(20) O:NR(1364)	Mean: 67 Med: NR Range: NR SD: 10	1364(42)	383(12)	Mean: 148 Med: NR Range: NR SD: 30	NR	NR	Mean: 27 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Looi, 2017 ⁸⁰	Arm 1(ICD): 269	F: 35(13) W: 147(54.7) AA: NR O: 5(1.9)	Mean: 58.1 Med: NR Range: NR SD: 11.9	132(49.1)	NR	Mean: 153.3 Med: NR Range: NR SD: 22.4	LBBB: 29(10.8) RBBB: 28(10.4) IVCD: 23(8.6) PBBlock: NR	I: 92(34.2); II: 145(53.9); III: 32(11.9); IV: NR	Mean: 24.6 Med: NR Range: NR SD: 5.2	Creat: NR GFR: 62.714.9
Looi, 2017 ⁸⁰	Arm 2(CRT-D): 116	F: 23(20) W: 89(77.4) AA: NR O: 1(0.9)	Mean: 61.1 Med: NR Range: NR SD: 10.1	26(22.6)	NR	Mean: 175.1 Med: NR Range: NR SD: 18.3	LBBB: 101(87.8) RBBB: 0(0) IVCD: 0(0) PBBlock: NR	I: 12(10.4); II: 58(50.4); III: 45(39.2); IV: NR	Mean: 23.9 Med: NR Range: NR SD: 5.7	Creat: NR GFR: 63.115.3

Table D5: Population characteristics –CRT D harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Masoudi,2014 ⁸³	Arm 1(ICD):3545	F: 990(3545)	Mean: 74.9 Med: NR Range: NR SD: 6	2513(70.9)	1164(32.8)	Mean: 149 Med: NR Range: NR SD: 23.1	LBBB: 1864(52.6) RBBB: 617(17.4) IVCD: 503(14.2) PBBBlock: NR	I: 103(2.9) II: 1041(29.4) III: 2321(65.5) IV: 80(2.3)	Mean: 25 Med: NR Range: NR SD: 6	Creat: 1.4mg/dl GFR: 59.6ML/MI N/1.73M2
Masoudi,2014 ⁸³	Arm 2(CRTD):3545	F: 993(3545)	Mean: 74.6 Med: NR Range: NR SD: 6	2419(68.2)	1101(31.1)	Mean: 149 Med: NR Range: NR SD: 19.6	LBBB: 1906(53.8) RBBB: 594(16.8) IVCD: 485(13.7) PBBBlock: NR	I: 97(2.7) II: 1056(29.8) III: 2283(64.4) IV: 109(3.1)	Mean: 25 Med: NR Range: NR SD: 6	Creat: 1.4mg/dl GFR: 59.5ML/MI N/1.73M2
Moss,2009 ⁹ MADIT CRT	Arm 1(ICD):731	F: 178(24.4) W:90.7(56/ 724) AA:7.7(11/ 724) O:1.5(401)	Mean: 64 Med: NR Range: NR SD: 11	401(54.9)	90/717(12. 6)	Mean: NR Med: NR Range: NR SD: NR	LBBB :520/729(71.3) RBBB: 92/729(12.6) IVCD: NR PBBBlock: NR	NR	Mean: 24 Med: NR Range: NR SD: NR	Creat: 1.2mg/dl GFR: NR

Table D5: Population characteristics –CRT D harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Moss,2009 ⁹ MADIT CRT	Arm 2(CRT- D):1089	F: 275(25.3) W:90.4(87/ 1083) AA:8(17/10 83) O:1.6(598)	Mean: 65 Med: NR Range: NR SD: 11	598(55)	118/1063(1 1.1)	Mean: NR Med: NR Range: NR SD: NR	LBBB :761/1088(69. 9) RBBB: 136/1088(12. 5) IVCD: NR PBBBlock: NR	NR	Mean: 24 Med: NR Range: NR SD: NR	Creat: 1.2mg/dl GFR: NR
Nian- Sang,2010 ⁸⁷	Overall(Overall (CRT_D)):54	F: 19(35) O:NR(14)	Mean: NR Med: NR Range: NR SD: NR	14(26)	NR	Mean: 125.2 Med: NR Range: NR SD: NR	NR	NR	Mean: 32.1 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Ouellet,2012 ¹⁸ MADIT CRT Sub Study	Arm 1(ICD):731	F: 178(24.4) W:90.7(56/ 724) AA:7.7(11/ 724) O:1.5	Mean: 64 Med: NR Range: NR SD: 11	NR	NR	Mean: NR Med: NR Range: NR SD: NR	LBBB :520/729(71.3) RBBB: 92/729(12.6) IVCD: NR PBBBlock: NR	NR	Mean: 24 Med: NR Range: NR SD: NR	Creat: 1.2mg/dl GFR: NR
Ouellet,2012 ¹⁸ MADIT CRT Sub Study	Arm 2(CRT- D):1089	F: 275(25.3) W:90.4(87/ 1083) AA:8(17/10 83) O:1.6	Mean: 65 Med: NR Range: NR SD: 11	NR	NR	Mean: NR Med: NR Range: NR SD: NR	LBBB :761/1088(69. 9) RBBB: 136/1088(12. 5) IVCD: NR PBBBlock: NR	NR	Mean: 24 Med: NR Range: NR SD: NR	Creat: 1.2mg/dl GFR: NR

Table D5: Population characteristics –CRT D harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Pinter,2009 ⁸⁸	Arm 1(CRT ON):36	F: 8(22.2) NR	Mean: 66.3 Med: NR Range: NR SD: 8.6	NR	6(16.7)	Mean: NR Med: NR Range: NR SD: NR	LBBB :NR RBBB: NR IVCD: NR PBBBlock: NR	NR	Mean: 24.2 (MUGA) 21.2 (ECHO) Med: NR Range: NR SD: 7.5	Creat: 121numol/ L GFR: NR
Pinter,2009 ⁸⁸	Arm 2(CRT OFF):36	F: 7(19.4) NR	Mean: 66.1 Med: NR Range: NR SD: 8.8	NR	2(5.6)	Mean: NR Med: NR Range: NR SD: NR	NR	NR	Mean: 26.8 (MUGA) 24 (ECHO) Med: NR Range: NR SD: 8.4	Creat: 114numol/ L GFR: NR
Ricci,2014 ⁸⁹	Overall:1404	F: 286(1404)	Mean: 67 Med: NR Range: NR SD: 10	741(53)	362(26)	Mean: 149 Med: NR Range: NR SD: 31	NR	I: NR II: 534(38) III: 842(60) IV: 28(2)	Mean: 27 Med: NR Range: NR SD: 6	Creat: NR GFR: NR
Ruwald,2014 ¹⁹	Arm 1(LVEF ≤35%):103	F: 19(103)	Mean: 63 Med: NR Range: NR SD: 12	63(61)	NR	Mean: 157 Med: NR Range: NR SD: 21	LBBB: 64(62) RBBB: 15(15) IVCD: 24(23) PBBBlock: NR	NR	Mean: 27.6 Med: NR Range: NR SD: 3.1	Creat: 1.24mg/dl GFR: NR
Ruwald,2014 ¹⁹	Arm 2(LVEF 36-50%):594	F: 136(594)	Mean: 65 Med: NR Range: NR SD: 11	335(56)	NR	Mean: 159 Med: NR Range: NR SD: 20	LBBB: 421(71) RBBB: 65(11) IVCD: 107(18) PBBBlock: NR	NR	Mean: 29.5 Med: NR Range: NR SD: 3	Creat: 1.16mg/dl GFR: NR

Table D5: Population characteristics –CRT D harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Ruwald,2014 ¹⁹	Arm 3(LVEF >50%):55	F: 30(55) NR	Mean: 64 Med: NR Range: NR SD: 9	14(25)	NR	Mean: 159 Med: NR Range: NR SD: 17	LBBB: 49(89) RBBB: 3(5) IVCD: 3(5) PBBBlock: NR	NR	Mean: 33.1 Med: NR Range: NR SD: 3.3	Creat: 1.09mg/dl GFR: NR
Sabbag, 2016 ²⁰	Arm 1(White): 1613	F: 382(24) W: 1613(100) AA: 0(0) O: NR	Mean: NR Med: NR Range: Age≥65: 883 (55%) SD: NR	class 1 is 248, class 2 is 665(class 1 is 15%, class 2 is41%)	199(13)	Mean: NR Med: NR Range: QRS <0.15: 565 (35%) SD: NR	LBBB: 1153(72) RBBB: 194(12) IVCD: 264(16) PBBBlock: NR	I: 248(15); II: NR; III: NR; IV: NR	Mean: 29 Med: NR Range: NR SD: 3.4	Creat: NR GFR: 68.7 (SD 19.8) eGFR
Sabbag, 2016 ²⁰	Arm 2(Black): 139	F: 54(39) W: 0(0) AA: 139(100) O: NR	Mean: NR Med: NR Range: Age≥65: 57 (41%) SD: NR	class 1 is 8, class 2 is 39(class 1 is 6%, class 2 is 28%)	7(5)	Mean: NR Med: NR Range: QRS <0.15: 54 (39%) SD: NR	LBBB: 91(65) RBBB: 20(14) IVCD: 28(20) PBBBlock: NR	I: 8(6); II: NR; III: NR; IV: NR	Mean: 28.9 Med: NR Range: NR SD: 2.9	Creat: NR GFR: 75.5 (SD 22.7) eGFR

Table D5: Population characteristics –CRT D harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Sapp, 2017 ³⁰	Arm 1(Primary indication: ICD): 772	F: 142(18.4) NR	Mean: 66 Med: NR Range: NR SD: 9.4	497(64.4)	99(12.8)	Mean: 158 Med: NR Range: NR SD: 23.9	LBBB: 540(70) RBBB: 82(10.6) IVCD: 91(11.8) PBBBlock: NR	I: NR; II: 663(82); III: 139(18); IV: NR	Mean: 22.7 Med: NR Range: NR SD: 5	NR
Sapp, 2017 ³⁰	Arm 2(Primary indication: CRT-D): 759	F: 117(15.4) NR	Mean: 65.9 Med: NR Range: NR SD: 9.3	514(76.7)	96(12.7)	Mean: 156.8 Med: NR Range: NR SD: 23.7	LBBB: 553(72.9) RBBB: 58(7.6) IVCD: 89(11.7) PBBBlock: NR	I: NR; II: 613(80.8); III: 146(19.2); IV: NR	Mean: 22.6 Med: NR Range: NR SD: 5.5	NR
Sapp, 2017 ³⁰	Arm 3(Secondary indication: ICD): 112	F: 26(23.2) NR	Mean: 66.6 Med: NR Range: NR SD: 9.7	77(68.8)	7(6.3)	Mean: 161 Med: NR Range: NR SD: 24.5	LBBB: 91(81.3) RBBB: 11(9.8) IVCD: 7(6.3) PBBBlock: NR	I: NR; II: 84(75); III: 28(25); IV: NR	Mean: 22.4 Med: NR Range: NR SD: 5	NR

Table D5: Population characteristics –CRT D harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Sapp, 2017 ³⁰	Arm 4(Secondary indication: CRT-D): 121	F: 15(12.4) NR	Mean: 67.7 Med: NR Range: NR SD: 8.8	93(76.9)	14(11.6)	Mean: 159.1 Med: NR Range: NR SD: 22.1	LBBB: 90(74.4) RBBB: 8(6.6) IVCD: 15(12.4) PBBBlock: NR	I: NR; II: 88(72.7); III: 33(27.3); IV: NR	Mean: 22.5 Med: NR Range: NR SD: 5.2	NR
Sardu, 2017 ⁹³	Arm 1(CRT-D (MS - metabolic syndrome)): 46	F: 13(28) NR	Mean: NR Med: 67 Range: iqr 53-75 SD: NR	35(77)	NR	Mean: 145 Med: NR Range: NR SD: 11	NR	I: NR; II: 5(10); III: 41(90); IV: NR	Mean: 27 Med: NR Range: NR SD: 4	Creat: NR GFR: renal dysfunctio n 2, 9%
Sardu, 2017 ⁹³	Arm 2(CRT-D - No MS): 45	F: 13(29) NR	Mean: NR Med: 68 Range: iqr 54-75 SD: NR	25(55)	NR	Mean: 148 Med: NR Range: NR SD: 11	NR	I: NR; II: 9(25); III: 39(75); IV: NR	Mean: 28 Med: NR Range: NR SD: 4	Creat: NR GFR: renal dysfunctio n 7, 15%
Steffel, 2015 ⁹⁶	Arm 1(QRS 120–130): 139	F: 29(21) NR	Mean: 61.8 Med: NR Range: NR SD: 11.83	89(64.03)	NR	Mean: NR Med: NR Range: NR SD: NR	NR	I: 2(1.44); II: 4(2.88); III: 128(92.09); IV: 5(3.6)	Mean: 26.8 Med: NR Range: NR SD: 5.4	NR
Strimel, 2011 ⁹⁷	Overall:84	F: 21(25) O:(66)	Mean: 82.68 Med: NR Range: NR SD:	66(78.6)	NR	Mean: Med: Range: SD:	NR	I: 6(7.1) II: 33(39.3) III: 41(48.8) IV: 4(4.8)	Mean: 28.1 Med: NR Range: NR NR SD: 6.6	Creat: NR GFR: NR

Table D5: Population characteristics –CRT D harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Su, 2018 ⁹⁸	Arm 1(Right ventricular middle septum): 155	F: 48 (31) NR	Mean: 59.9 Med: NR Range: NR SD: 13.1	38(24.5)	NR	Mean: 159 Med: NR Range: NR SD: 25.2	LBBB: 103(66.5) RBBB: NR IVCD: NR PBBBlock: NR	I: 0(0) II: 12(7.7) III: 101(65.2) IV: 42(27.1)	Mean: 26 Med: NR Range: NR SD: 5.2	Creat: NR GFR: NR
Su, 2018 ⁹⁸	Arm 2(Right ventricular apical): 197	F: 56 (28.4) NR	Mean: 61.6 Med: NR Range: NR SD: 11.8	51(25.9)	NR	Mean: 154.3 Med: NR Range: NR SD: 24.4	LBBB: 129(65.5) RBBB: NR IVCD: NR PBBBlock: NR	I: 0(0) II: 21(10.7) III: 116(58.9) IV: 60(30.5)	Mean: 26 Med: NR Range: NR SD: 5.4	Creat: NR GFR: NR
Theuns,2005 ¹⁰¹	Arm 1(Primary prophylaxis):3 8	F: 12(32) NR	Mean: 60 Med: NR Range: NR SD: 9	NR	9(24)	Mean: NR Med: NR Range: NR SD: NR	NR	II: 4(11) III: 34(89)	Mean: 24 Med: NR Range: NR SD: 10	Creat: NR GFR: NR
Theuns,2005 ¹⁰¹	Arm 2(Secondary prophylaxis):4 8	F: 8(17) NR	Mean: 63 Med: NR Range: NR SD: 11	NR	14(29)	Mean: NR Med: NR Range: NR SD: NR	NR	II: 18(38) III: 30(62)	Mean: 23 Med: NR Range: NR SD: 8	Creat: NR GFR: NR
Theuns,2005 ¹⁰¹	Overall(Total): 86	F: 20(23) NR	Mean: 61 Med: NR Range: NR SD: 10	NR	23(27)	Mean: NR Med: NR Range: NR SD: NR	NR	II: 22(26) III: 64(74)	Mean: 23 Med: NR Range: NR SD: 8	Creat: NR GFR: NR
Vado,2014 ¹⁰²	Overall:45	F: 11(45)	Mean: 70.3 Med: NR Range: NR SD: 9	15(33)	NR	Mean: 155 Med: NR Range: NR SD: 29.7	LBBB: 25(55) RBBB: NR IVCD: 17(38) PBBBlock: 3(7)	NR	Mean: 27.1 Med: NR Range: NR SD: 5.1	Creat: NR GFR: NR

Table D5: Population characteristics –CRT D harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Ziacchi, 2018 ¹⁰⁵	Arm 1(Bipolar leads): 136	F: 34(25) NR	Mean: 63.9 Med: NR Range: NR SD: 12	NR	27(19.9)	Mean: 161 Med: NR Range: NR SD: 25.5	LBBB: 198(80.1) RBBB: NR IVCD: NR PBBBlock: NR	NR	Mean: 24.1 Med: NR Range: NR SD: 5.2	NR
Ziacchi, 2018 ¹⁰⁵	Arm 2(Quadripolar leads): 97	F: 21(22.6) NR	Mean: 67.1 Med: NR Range: NR SD: 12.2	NR	18(18.6)	Mean: 161.6 Med: NR Range: NR SD: 23.9	LBBB: 78(80.4) RBBB: NR IVCD: NR PBBBlock: NR	NR	Mean: 27.9 Med: NR Range: NR SD: 5.4	NR
Ziacchi, 2018 ¹⁰⁵	Arm 3(Active Fixation leads): 57	F: 22(38.6) NR	Mean: 70.7 Med: NR Range: NR SD: 13.5	NR	14(24.6)	Mean: 164.1 Med: NR Range: NR SD: 26.5	LBBB: 50(87.7) RBBB: NR IVCD: NR PBBBlock: NR	NR	Mean: 27.8 Med: NR Range: NR SD: 5.2	NR
Ziacchi, 2018 ¹⁰⁵	Overall: 290	F: 77(26.6) NR	Mean: 66.3 Med: NR Range: NR SD: 12.6	NR	59(20.3)	Mean: 161.7 Med: NR Range: NR SD: 25.1	LBBB: 237(81.7) RBBB: NR IVCD: NR PBBBlock: NR	NR	Mean: 26 Med: NR Range: NR SD: 5.6	NR

Table D5: Population characteristics –CRT D harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Zue, 2016 ¹⁰⁷	Arm 1(acute TpTe shorten group<0): 43	F: 15(35) NR	Mean: 61.4 Med: NR Range: NR SD: 10.89	12(28)	7(16)	Mean: 161 Med: NR Range: NR SD: 30	LBBB: 36(84) RBBB: NR IVCD: NR NRPBBBlock: NR	NR	Mean: 27.12 Med: NR Range: NR SD: 7.78	NR
Zue, 2016 ¹⁰⁷	Arm 2(acute TpTe shorten group>=0): 58	F: 16(28) NR	Mean: 59.02 Med: NR Range: NR SD: 10.55	15(26)	9(16)	Mean: 156 Med: NR Range: NR SD: 25	LBBB: 45(78) RBBB: NR IVCD: NR NRPBBBlock: NR	NR	Mean: 29.78 Med: NR Range: NR SD: 8.53	NR
Zue, 2016 ¹⁰⁷	Arm 3(Chronic TpTe non- shorten group <0): 65	F: 21(32) NR	Mean: 59.12 Med: NR Range: NR SD: 10.73	19(29)	9(14)	Mean: 159 Med: NR Range: NR SD: 25	LBBB: 56(86) RBBB: NR IVCD: NR NRPBBBlock: NR	NR	Mean: 29.38 Med: NR Range: NR SD: 8.73	NR
Zue, 2016 ¹⁰⁷	Arm 4(Chronic TpTe non- shorten group >=0): 36	F: 10(28) NR	Mean: 61.67 Med: NR Range: NR SD: 10.63	8(22)	7(19)	Mean: 157 Med: NR Range: NR SD: 31	LBBB: 25(69) RBBB: NR IVCD: NR NRPBBBlock: NR	NR	Mean: 27.31 Med: NR Range: NR SD: 7.35	NR

F-Female, W-White, AA-African American, O-Others, NR-Not Reported, SD-Standard Deviation, Med-Median, n-Number, LBBB-Left Bundle Branch Block, RBBB-Right, Bundle Branch Block, IVCD-Intra Ventricular Conduction Delay, PBBBlock-Paced Bundle Branch Block, NYHA-New York Heart Association, LVEF-Left Ventricular Ejection Fraction, GFR-Glomerular Filtration Rate

Table D6: Population characteristics –CRT P vs. D effectiveness

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Anand, 2009 ³⁵ COMPANION Sub Study	Arm 1(OPT):308	F: 96(31) NR	Mean: NR Med: 68 Range: NR SD: NR	NR(59)	NR	Mean: NR Med: 158 Range: NR SD: NR	NR	III: NR(82)	Mean: 22 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Anand, 2009 ³⁵ COMPANION Sub Study	Arm 2(CRT- P):617	F: 203(33) NR	Mean: NR Med: 67 Range: NR SD: NR	NR(54)	NR	Mean: NR Med: 160 Range: NR SD: NR	NR	III: NR(87)	Mean: 20 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Anand, 2009 ³⁵ COMPANION Sub Study	Arm 3(CRT- D):595	F: 196(33) NR	Mean: NR Med: 66 Range: NR SD: NR	NR(55)	NR	Mean: NR Med: 160 Range: NR SD: NR	NR	III: NR(86)	Mean: 22 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Bristow,2004 ³⁴ COMPANION	Arm 1(Optimal Pharmacologic al Therapy):308	F: 96(31) NR	Mean: 68 Med: NR Range: NR SD: NR	NR(59)	NR	Mean: 158 Med: NR Range: NR SD: NR	LBBB:NR(70) RBBB: NR(9) IVCD: NR PBBBlock: NR	III: NR(82)	Mean: 22 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Bristow,2004 ³⁴ COMPANION	Arm 2(CRT- P):617	F: 203(33) NR	Mean: 67 Med: NR Range: NR SD: NR	NR(54)	NR	Mean: 160 Med: NR Range: NR SD: NR	LBBB:NR(69) RBBB:NR(12) IVCD: NR PBBBlock: NR	III: NR(87)	Mean: 20 Med: NR Range: NR SD: NR	Creat: NR GFR: NR

Table D6: Population characteristics –CRT P vs. D effectiveness (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Bristow,2004 ³⁴ COMPANION	Arm 3(CRT- D):595	F: 196(33) NR	Mean: 66 Med: NR Range: NR SD: NR	NR(55)	NR	Mean: 160 Med: NR Range: NR SD: NR	LBBB:NR(73) RBBB:NR(10) IVCD: NR PBBBlock: NR	III: NR(86)	Mean: 22 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Carson,2005 ³⁶ COMPANION Sub Study	Arm 1(Optimal Pharmacologic al therapy):308	F: 96(31) NR	Mean: 68 Med: NR Range: NR SD: NR	NR(59)	NR	Mean: 158 Med: NR Range: NR SD: NR	LBBB:NR(70) RBBB: NR(9) IVCD: NR PBBBlock: NR	III: NR(82)	Mean: 22 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Carson,2005 ³⁶ COMPANION Sub Study	Arm 2(CRT- P):617	F: 203(33) NR	Mean: 67 Med: NR Range: NR SD: NR	NR(54)	NR	Mean: 160 Med: NR Range: NR SD: NR	LBBB:NR(69) RBBB:NR(12) IVCD: NR PBBBlock: NR	III: NR(87)	Mean: 20 Med: NR Range:NR SD: NR	Creat: NR GFR: NR
Carson,2005 ³⁶ COMPANION Sub Study	Arm 3(CRT- D):595	F: 196(33) NR	Mean: 66 Med: NR Range: NR SD: NR	NR(55)	NR	Mean: 160 Med: NR Range: NR SD: NR	LBBB:NR(73) RBBB:NR(10) IVCD: NR PBBBlock: NR	III: NR(86)	Mean: 22 Med: NR Range: NR SD: NR	Creat: NR GFR: NR

Table D6: Population characteristics –CRT P vs. D effectiveness (continued)

Author, Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Shamoun, 2019 ³⁸ COMPANION Sub Study	Overall: 1260	"F: 416 (33) W: NR(NR) AA: NR O: NR(693)"	"Mean: 66 Med: NR Range: NR SD: NR"	693(55)	NR	Mean: 160 Med: NR Range: 140 to 176 SD: NR	LBBB:895(71)) RBBB:NR(10)) IVCD: NR PBBBlock: NR	III: 1084(86)	"Mean: 0.2 Med: NR Range: 0.16 to 0.26 SD: NR"	Creat: NR GFR: NR

F-Female, W-White, AA-African American, O-Others, NR-Not Reported, SD-Standard Deviation, Med-Median, n-Number, LBBB-Left Bundle Branch Block, RBBB-Right, Bundle Branch Block, IVCD-Intra Ventricular Conduction Delay, PBBBlock-Paced Bundle Branch Block, NYHA-New York Heart Association, LVEF-Left Ventricular Ejection Fraction, GFR-Glomerular Filtration Rate

Table D7: Population characteristics –CRT P vs. D harms

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Anand, 2009 ³⁵ COMPANION Sub Study	Arm 1(OPT):308	F: 96(31) NR	Mean: NR Med: 68 Range: NR SD: NR	NR(59)	NR	Mean: NR Med: 158 Range: NR SD: NR	NR	III: NR(82)	Mean: 22 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Anand, 2009 ³⁵ COMPANION Sub Study	Arm 2(CRT- P):617	F: 203(33) NR	Mean: NR Med: 67 Range: NR SD: NR	NR(54)	NR	Mean: NR Med: 160 Range: NR SD: NR	NR	III: NR(87)	Mean: 20 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Anand, 2009 ³⁵ COMPANION Sub Study	Arm 3(CRT- D):595	F: 196(33) NR	Mean: NR Med: 66 Range: NR SD: NR	NR(55)	NR	Mean: NR Med: 160 Range: NR SD: NR	NR	III: NR(86)	Mean: 22 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Azizi, 2006 ⁴⁵	Overall:244	F: (18) NR	Mean: 64 Med: NR Range: 14- 90 SD: 12	NR	(0.29)	Mean: NR Med: NR Range: NR SD: NR	NR	II: (10) III: (68) IV: (22)	Mean: 0.24 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Barra, 2018 ⁴⁶	Arm 1(CRT-D): 1785	F: 348(19.5) NR	Mean: 65.2 Med: NR Range: NR SD: 11.4	907(50.8)	550(30.8)	Mean: 153.5 Med: NR Range: NR SD: 28.4	NR	I: 40(2.2); II: 340(19.1); III: 1287(72.1); IV: 117(6.6)	Mean: 25.7 Med: NR Range: NR SD: 6.7	Creat: NR GFR: GFR <30 are 175, 9.8%
Barra, 2018 ⁴⁶	Arm 2(CRT-P): 1223	F: 464(37.9) NR	Mean: 73.2 Med: NR Range: NR SD: 10.4	508(41.5)	448(36.6)	Mean: 158.9 Med: NR Range: NR SD: 27.4	NR	I: 11(0.9); II: 165(13.5); III: 890(72.8); IV: 157(12.8)	Mean: 27.3 Med: NR Range: NR SD: 8.2	Creat: NR GFR: GFR <30 are 186, 15.2%

Table D7: Population characteristics –CRT P vs. D harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Bristow,2004 ³⁴ COMPANION	Arm 1(Optimal Pharmacologic al Therapy):308	F: 96(31) NR	Mean: 68 Med: NR Range: NR SD: NR	NR(59)	NR	Mean: 158 Med: NR Range: NR SD: NR	LBBB:NR(70) RBBB: NR(9) IVCD: NR PBBBlock: NR	III: NR(82)	Mean: 22 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Bristow,2004 ³⁴ COMPANION	Arm 2(CRT- P):617	F: 203(33) NR	Mean: 67 Med: NR Range: NR SD: NR	NR(54)	NR	Mean: 160 Med: NR Range: NR SD: NR	LBBB:NR(69) RBBB:NR(12) IVCD: NR PBBBlock: NR	III: NR(87)	Mean: 20 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Bristow,2004 ³⁴ COMPANION	Arm 3(CRT- D):595	F: 196(33) NR	Mean: 66 Med: NR Range: NR SD: NR	NR(55)	NR	Mean: 160 Med: NR Range: NR SD: NR	LBBB:NR(73) RBBB:NR(10) IVCD: NR PBBBlock: NR	III: NR(86)	Mean: 22 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Carson,2005 ³⁶ COMPANION Sub Study	Arm 1(Optimal Pharmacologic al therapy):308	F: 96(31) NR	Mean: 68 Med: NR Range: NR SD: NR	NR(59)	NR	Mean: 158 Med: NR Range: NR SD: NR	LBBB:NR(70) RBBB: NR(9) IVCD: NR PBBBlock: NR	III: NR(82)	Mean: 22 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Carson,2005 ³⁶ COMPANION Sub Study	Arm 2(CRT- P):617	F: 203(33) NR	Mean: 67 Med: NR Range: NR SD: NR	NR(54)	NR	Mean: 160 Med: NR Range: NR SD: NR	LBBB:NR(69) RBBB:NR(12) IVCD: NR PBBBlock: NR	III: NR(87)	Mean: 20 Med: NR Range:NR SD: NR	Creat: NR GFR: NR

Table D7: Population characteristics –CRT P vs. D harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Carson,2005 ³⁶ COMPANION Sub Study	Arm 3(CRT- D):595	F: 196(33) NR	Mean: 66 Med: NR Range: NR SD: NR	NR(55)	NR	Mean: 160 Med: NR Range: NR SD: NR	LBBB:NR(73) RBBB:NR(10) IVCD: NR PBBBlock: NR	III: NR(86)	Mean: 22 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Doring, 2018 ⁵⁵	Arm 1(CRT-P): 80	F: 35(43.7) NR	Mean: 82.6 Med: NR Range: NR SD: 4.5	40(50)	19(23.8)	Mean: 150 Med: NR Range: NR SD: 19	LBBB: 44(55) RBBB: 1(1.3) IVCD: NRPBBBlock: NR	I: NR; II: 13(16.3); III: 63(78.7); IV: 4(5)	Mean: 29.6 Med: NR Range: NR SD: 5.9	Creat: NR GFR: NR
Doring, 2018 ⁵⁵	Arm 2(CRT-D): 97	F: 23(24.5) NR	Mean: 77.8 Med: NR Range: NR SD: 1.9	52(53.1)	20(20.4)	Mean: 158 Med: NR Range: NR SD: 18	LBBB: 65(67) RBBB: 2(2.1) IVCD: NRPBBBlock: NR	I: NR; II: 16(16.5); III: 78(80.4); IV: 3(3.1)	Mean: 57.4 Med: NR Range: NR SD: 6	Creat: NR GFR: NR
Killu,2011 ³⁷	Arm 1(≤80):638	F: 147(23) NR	Mean: 66.5 Med: NR Range: NR SD: 10.3	349(54.7)	179(28.1)	Mean: 164.5 Med: NR Range: NR SD: 34.7	NR	NR	Mean: 23.5 Med: NR Range: NR SD: NR	Creat: 1.4 GFR: NR
Killu,2011 ³⁷	Arm 2(≥80):90	F: 19(21.1) NR	Mean: 83.7 Med: NR Range: NR SD: 2.3	63(70)	34(37.8)	Mean: 171.5 Med: NR Range: NR SD: 29.5	NR	NR	Mean: 24.3 Med: NR Range: NR SD: NR	Creat: 1.6 GFR: NR
Kober, 2016 ⁷²	Arm 1(ICD/CRT- ICD): 556	F: 151(27) NR	Mean: NR Med: 64 Range: IQR (56–72) SD: NR	0(0)	NR	Mean: NR Med: 146 Range: IQR (114-166) SD: nr	NR	I: 0(0); II: 297(53); III: 252(45); IV: 7(1)	Mean: NR Med: 0.25 Range: IQR (20-30) SD: NR	Creat: NR GFR: Median 74ml/min/1 .73m2

Table D7: Population characteristics –CRT P vs. D harms (continued)

Author, Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Kober, 2016 ⁷²	Arm 1(Medical therapy/CRT-Pacer): 560	F: 156(28) NR	Mean: NR Med: 63 Range: (56–70) SD: NR	0(0)	NR	Mean: NR Med: 145 Range: IQR(110-164) SD: nr	NR	I: 0(0); II: 300(54); III: 253(45); IV: 7(1)	Mean: NR Med: 0.25 Range: IQR (20-30) SD: NR	Creat: NR GFR: Median 73ml/min/1 .73m2
Looi, 2018 ⁸¹	Arm 1(CRT-D): 157	F: 34 (21.7) W: 121(77.1) AA: NR O: Maori/Pacific Islander/Asia n: 35(22.9)	Mean: 61.5 Med: 63.4 Range: NR SD: 10.2	40(25.5)	36(22.9)	Mean: 175.1 Med: NR Range: NR SD: 24.6	LBBB: 131(83.4) RBBB: NR IVCD: 1(0.6) PBBBlock: NR	I: 18(11.5) II: 75(47.8) III: 64(40.8) IV: 0(0)	Mean: 24.7 Med: NR Range: NR SD: 6.1	Creat: NR GFR: Median 60 (IQR 51)
Looi, 2018 ⁸¹	Arm 2(CRT-P): 43	F: 14 (32.6) W: 38(88.3) AA: NR O: Maori/Pacific Islander/Asia n: 5(11.7)	Mean: 65.9 Med: 69.7 Range: NR SD: 14	4(9.3)	18(41.8)	Mean: 177.3 Med: NR Range: NR SD: 33	LBBB: 12(27.9) RBBB: NR IVCD: 1(2.3) PBBBlock: NR	I: 6(14) II: 12(27.9) III: 24(55.8) IV: 1(2.3)	Mean: 33.7 Med: NR Range: NR SD: 10.5	Creat: NR GFR: Median 60 (IQR 50)
Nakajima, 2018 ⁸⁵	Overall: 243	F: 51(21) NR	Mean: 65 Med: NR Range: NR SD: 13	54(22)	123(50.6)	Mean: 166 Med: NR Range: NR SD: 39	LBBB: 170(70) RBBB: NR IVCD: NR PBBBlock: NR	I: NR; II: 65(27); III: 149(61); IV: 29(12)	Mean: 25 Med: NR Range: NR SD: 9	Creat: NR GFR: NR

Table D7: Population characteristics –CRT P vs. D harms (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Nezorov, 2018 ⁸⁶	Arm 1(Male): 144	F: 0(0) NR	Mean: 66.9 Med: NR Range: NR SD: 11.2	NR	65(45.1)	Mean: 146 Med: NR Range: NR SD: 21	LBBB: 82(57) RBBB: NRIVCD: NR PBBBlock: NR	I: NR; II: NR; III: 116(80.6); IV: 16(11.1)	Mean: 27.1 Med: NR Range: NR SD: 7.5	Creat: NR GFR: NR
Nezorov, 2018 ⁸⁶	Arm 2(Female): 34	F: 34(100) NR	Mean: 67.8 Med: NR Range: NR SD: 12.8	NR	12(35.3)	Mean: 148 Med: NR Range: NR SD: 22	LBBB: 26(76.5) RBBB: NRIVCD: NRPBBBlock: NR	I: NR; II: NR; III: 31(91.2); IV: 1(2.9)	Mean: 24.4 Med: NR Range: NR SD: 8.6	Creat: NR GFR: NR
Romeyer- Bouchard,2010 ⁹ 1	(Overall):303	F: 56(18.5) NR	Mean: 70 Med: NR Range: NR SD: 10	101(33.3)	105(34.7)	Mean: 185 Med: NR Range: NR SD: 25	NR	NR	Mean: 26 Med: NR Range: NR SD: NR	Creat: NR GFR: NR

Table D7: Population characteristics –CRT P vs. D harms (continued)

Author, Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Schuchert, 2013 ⁴² MASCOT Sub Study	Arm 1(CRT-P):174	F: 53(31) NR	Mean: 68 Med: NR Range: NR SD: 10	NR	37(16)	Mean: 169 Med: NR Range: NR SD: 31	NR	III: 145(83)	Mean: 25 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Schuchert, 2013 ⁴² MASCOT Sub Study	Arm 2(CRT-D):228	F: 30(24) NR	Mean: 68 Med: NR Range: NR SD: 9	NR	38(22)	Mean: 159 Med: NR Range: NR SD: 26	NR	III: 199(87)	Mean: 25 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Swindle, 2010 ⁹⁹	Overall:26887	F: 7366(27.4) W:18457(68.6) AA:3481(12.9) O:4949	Mean: NR Med: NR Range: NR SD: NR	NR	NR	Mean: NR Med: NR Range: NR SD: NR	NR	NR	Mean: NR Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Takaya, 2013 ¹⁰⁰	Arm 1(Responders):16	F: 5(31) NR	Mean: 63 Med: Range: SD: 8	3(19)	3(19)	Mean: NR Med: NR Range: NR SD: NR	NR	NR	Mean: 0.23 Med: NR Range: NR SD: NR	Creat: NR GFR: NR
Takaya, 2013 ¹⁰⁰	Arm 2(Non-responders):24	F: 5(21) NR	Mean: 58 Med: Range: SD: 16	7(29)	3(13)	Mean: NR Med: NR Range: NR SD: NR	LBBB : NR RBBB: NR IVCD: 24(100) PBBBlock: NR	NR	Mean: 0.28 Med: NR Range: NR SD: NR	Creat: NR GFR: NR

Table D7: Population characteristics –CRT P vs. D harms (continued)

Author, Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Verbrugge,2013 ¹⁰³	Arm 1(CRT-D):74	F: 12(16) NR	Mean: 68 Med: NR Range: NR SD: 9	47(64)	8(11)	Mean: NR Med: NR Range: NR SD: NR	NR	NR	Mean: NR Med: NR Range: NR SD: NR	Creat: NR GFR: 67ML/MIN/1.73M2
Verbrugge,2013 ¹⁰³	Arm 2(CRT-P):98	F: 43(44) NR	Mean: 74 Med: NR Range: NR SD: 9	36(37)	40(41)	Mean: NR Med: NR Range: NR SD: NR	NR	NR	Mean: NR Med: NR Range: NR SD: NR	Creat: NR GFR: 63ML/MIN/1.73M2
Verbrugge,2013 ¹⁰⁴	Arm 1(<70 years):76	F: 25(33) NR	Mean: NR Med: NR Range: NR SD: NR	28(37)	16(21)	Mean: 147 Med: nr Range: NR SD: 29	LBBB :63(83) RBBB: NR IVCD: NR PBBBlock: NR	II: 27(36) III: 41(54) IV: 8(10)	Mean: 29 Med: NR Range: NR SD: NR	Creat: NR GFR: 72ml/min/1.73m2
Verbrugge,2013 ¹⁰⁴	Arm 2(70-79years):95	F: 30(32) NR	Mean: NR Med: NR Range: NR SD: NR	51(54)	25(26)	Mean: 159 Med: NR Range: NR SD: 31	LBBB :80(84) RBBB: NR IVCD: NR PBBBlock: NR	II: 23(24) III: 63(66) IV: 9(10)	Mean: 29 Med: NR Range: NR SD: NR	Creat: NR GFR: 61ml/min/1.73m2
Verbrugge,2013 ¹⁰⁴	Arm 3(>=80 years):49	F: 17(35) NR	Mean: NR Med: NR Range: NR SD: NR	31(63)	16(33)	Mean: 163 Med: NR Range: NR SD: 30	LBBB :40(82) RBBB: NR IVCD: NR PBBBlock: NR	II: 13(27) III: 30(61) IV: 6(12)	Mean: 31 Med: NR Range: NR SD: NR	Creat: NR GFR: 52ml/min/1.73m2
Verbrugge,2013 ¹⁰⁴	Overall:220	F: 72(33) NR	Mean: NR Med: NR Range: NR SD: NR	110(50)	57(26)	Mean: 156 Med: NR Range: NR SD: 31	LBBB :183(83) RBBB: NR IVCD: NR PBBBlock: NR	II: 63(29) III: 134(61) IV: 23(10)	Mean: 29 Med: NR Range: NR SD: NR	Creat: NR GFR: 63ml/min/1.73m2

Table D7: Population characteristics –CRT P vs. D harms (continued)

F-Female, W-White, AA-African American, O-Others, NR-Not Reported, SD-Standard Deviation, Med-Median, n-Number, LBBB-Left Bundle Branch Block, RBBB-Right, Bundle Branch Block, IVCD-Intra Ventricular Conduction Delay, PBBBlock-Paced Bundle Branch Block, NYHA-New York Heart Association, LVEF-Left Ventricular Ejection Fraction, GFR-Glomerular Filtration Rate

Table D8: Population characteristics –Alternative CRT Techniques versus Conventional Cardiac Resynchronization Therapy Techniques effectiveness

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Bencardino, 2016 ⁴⁷	Arm 1(Quadripolar) : 23	F: 2(8.7) NR	Mean: 68 Med: NR Range: NR SD: 11	12(52)	NR	Mean: 165 Med: NR Range: NR SD: 21	NR	NR	Mean: 25 Med: NR Range: NR SD: 6	Creat: NR GFR: NR
Bencardino, 2016 ⁴⁷	Arm 2(Bipolar): 20	F: 4(20) NR	Mean: 71 Med: NR Range: NR SD: 6	10(50)	NR	Mean: 162 Med: NR Range: NR SD: 11	NR	NR	Mean: 27 Med: NR Range: NR SD: 3	Creat: NR GFR: NR
Leclercq, 2019 ⁷⁹	Overall: 467	"F: 95 (20.3) W: NR(NR) AA: NR O: NR(252.18) "	"Mean: 68 Med: NR Range: NR SD: 10"	252 (54)	NR	"Mean: 156 Med: NR Range: NR SD: 25"	LBBB : 312(66.8) RBBB: NR IVCD: NR PBBBlock: NR	"I: 78(16.8) II: 303 (64.9) III: 83 (17.9) IV: 2(0.4)"	Mean: 26 Med: NR Range: NR SD: 8	Creat: NR GFR: NR
Sardu, 2017 ⁹²	Arm 1(Quadripolar) : 99	F: 28(28) NR	Mean: 68.1 Med: NR Range: NR SD: 6.6	67(68)	NR	Mean: 137.3 Med: NR Range: NR SD: 7.4	NR	II: 53(53.5); III: 49(49.5)	Mean: 27 Med: NR Range: NR SD: 5	Creat: NR GFR: NR
Sardu, 2017 ⁹²	Arm 2(Bipolar): 96	F: 23(24) NR	Mean: 66.9 Med: NR Range: NR SD: 6.4	61(63.5)	NR	Mean: 135.3 Med: NR Range: NR SD: 8.1	NR	II: 50(52); III: 44(45.8)	Mean: 28 Med: NR Range: NR SD: 4	Creat: NR GFR: NR

F-Female, W-White, AA-African American, O-Others, NR-Not Reported, SD-Standard Deviation, Med-Median, n-Number, LBBB-Left Bundle Branch Block, RBBB-Right, Bundle Branch Block, IVCD-Intra Ventricular Conduction Delay, PBBBlock-Paced Bundle Branch Block, NYHA-New York Heart Association, LVEF-Left Ventricular Ejection Fraction, GFR-Glomerular Filtration Rate

Table D9: Population characteristics – Alternative CRT Techniques versus Conventional Cardiac Resynchronization Therapy Techniques harms

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Forleo, 2015 ⁵⁸	Arm 1(CRT-D Quartet): 230	F: 49(21.3) NR	Mean: 70.3 Med: NR Range: NR SD: 9.2	NR	NR	Mean: 153.8 Med: NR Range: NR SD: 24.5	NR	NR	Mean: 27 Med: NR Range: NR SD: 5.9	NR
Forleo, 2015 ⁵⁸	Arm 2(CRT-D Bipolar): 188	F: 47(25) NR	Mean: 69.7 Med: NR Range: NR SD: 9.5	NR	NR	Mean: 149.4 Med: NR Range: NR SD: 26	NR	NR	Mean: 26.5 Med: NR Range: NR SD: 6.5	NR
Laish-Farkash, 2018 ⁷⁶	Arm 1(Group III): 5	F: 0(0) NR	Mean: 75 Med: NR Range: NR SD: 9	3(60)	4(80)	Mean: 172 Med: NR Range: 150- 200 SD: 19	NR	I: 0(0); II: 5(100); III: 0(0); IV: 0(0)	Mean: 17 Med: NR Range: NR SD: 5	NR
Sardu, 2017 ⁹²	Arm 1(Quadripolar) : 99	F: 28(28) NR	Mean: 68.1 Med: NR Range: NR SD: 6.6	67(68)	NR	Mean: 137.3 Med: NR Range: NR SD: 7.4	NR	I: NR; II: 53(53.5); III: 49(49.5); IV: NR	Mean: 27 Med: NR Range: NR SD: 5	NR
Sardu, 2017 ⁹²	Arm 2(Bipolar): 96	F: 23(24) NR	Mean: 66.9 Med: NR Range: NR SD: 6.4	61(63.5)	NR	Mean: 135.3 Med: NR Range: NR SD: 8.1	NR	I: NR; II: 50(52); III: 44(45.8); IV: NR	Mean: 28 Med: NR Range: NR SD: 4	NR

Table D9: Population characteristics – Alternative CRT Techniques versus Conventional Cardiac Resynchronization Therapy Techniques (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Ziacchi, 2018 ¹⁰⁶	Arm 1(Quadripolar) : 109	F: 30(27.5) NR	Mean: 69.2 Med: NR Range: NR SD: 10.1	53(48.6)	32(29.5)	Mean: 150.5 Med: NR Range: NR SD: 22.9	LBBB: 74(68) RBBB: 6(6) IVCD: NR PBBBlock: 7(6.1)	NR	Mean: 28 Med: NR Range: NR SD: 6.8	NR
Ziacchi, 2018 ¹⁰⁶	Arm 2(Bipolar): 121	F: 24(19.8) NR	Mean: 67.8 Med: NR Range: NR SD: 10.6	56(47.1)	33(27.4)	Mean: 153.5 Med: NR Range: NR SD: 29.3	LBBB: 86(71.3) RBBB: 13(10.6) IVCD: NR PBBBlock: 7(6.2)	NR	Mean: 28.2 Med: NR Range: NR SD: 6.1	NR

F-Female, W-White, AA-African American, O-Others, NR-Not Reported, SD-Standard Deviation, Med-Median, n-Number, LBBB-Left Bundle Branch Block, RBBB-Right, Bundle Branch Block, IVCD-Intra Ventricular Conduction Delay, PBBBlock-Paced Bundle Branch Block, NYHA-New York Heart Association, LVEF-Left Ventricular Ejection Fraction, GFR-Glomerular Filtration Rate

Table D10: Population characteristics – His bundle pacing or CRT versus RV pacing

Author, Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Bhatt, 2018 ⁴⁸	Arm 1(His bundle pacing): 101	F: 32(32) NR	Mean: 76.2 Med: NR Range: NR SD: 9.8	NR	37(37)	Non-selective HBP (No Bundle branch block): Mean 89 (SD 10) Non-selective HBP (Bundle branch block): Mean 152 (SD 19) Selective HBP (No Bundle branch block): Mean 101 (SD 11) Selective HBP (Bundle branch block): Mean 156 (SD 48)	NR	NR	Mean: 52 Med: NR Range: NR SD: 12	Creat: NR GFR: NR

Table D10: Population characteristics – His bundle pacing or CRT versus RV pacing (continued)

Author,Year Trial	Arm (arm name): n(%)	Female, n (%) Race, n(%)	Age (years) Mean, median, range	Ischemic cardiomyopathy, n (%)	Atrial fibrillation, n (%)	QRS interval, Mean, median, range	QRS morphology - LBBB, n(%) RBBB, n(%) IVCD, n(%) PBBBlock, n(%)	NYHA class, n(%)	LVEF, Mean, median, range, SD	Creatinine GFR
Bhatt, 2018 ⁴⁸	Arm 2(Non-His bundle pacing): 326	F: 160(49) NR	Mean: 80.9 Med: NR Range: NR SD: 10.1	NR	172(53)	Mean: NR Med: NR Range: NR SD: NR	NR	NR	Mean: 56 Med: NR Range: NR SD: 10	Creat: NR GFR: NR
Shan, 2017 ⁹⁴	Arm 1(Right ventricular apical): 11	F: 7(43.8) NR	Mean: NR Med: NR Range: 67- 91 SD: NR	NR	NR	Mean: NR Med: NR Range: 97- 161 SD: NR	NR	I: 0(0) II: 3(27.2) III: 5(45.5) IV: 3(27.2)	Mean: NR Med: NR Range: 21- 49 SD: NR	Creat: NR GFR: NR
Shan, 2017 ⁹⁴	Arm 2(Biventricular pacing non- responder): 5	F: 0(0) NR	Mean: NR Med: NR Range: 46- 81 SD: NR	NR	NR	Mean: NR Med: NR Range: 120- 221 SD: NR	NR	I: 0(0) II: 0(0) III: 4(80) IV: 1(20)	Mean: NR Med: NR Range: 26- 42 SD: NR	Creat: NR GFR: NR

F-Female, W-White, AA-African American, O-Others, NR-Not Reported, SD-Standard Deviation, Med-Median, n-Number, LBBB-Left Bundle Branch Block, RBBB-Right, Bundle Branch Block, IVCD-Intra Ventricular Conduction Delay, PBBBlock-Paced Bundle Branch Block, NYHA-New York Heart Association, LVEF-Left Ventricular Ejection Fraction, GFR-Glomerular Filtration Rate

Table D11: Outcomes reported in the trials assessing effectiveness of CRT P

Author,Year Trial	Arm(nam e)	Outcome Units	Baselin e N	Baselin e Outco me	Timepoi nt	N at Timepoi nt	Outcome at Timepoi nt	Within Arm Compariso ns	Between Arm Compariso ns
6 minute hall walk distance									
Kalscheur, 2017 ³⁷ Companion Sub Study	CRT- Atrial fibrillation /flutter	6 minute hall walk distance	69	NR	6 months	69	NR	Mean change from baseline: 28	P=0.18
Kalscheur, 2017 ³⁷ Companion Sub Study	CRT-No atrial fibrillation /flutter	6 minute hall walk distance	71	NR	6 months	71	NR	Mean change from baseline: 51	p<0.001
Kalscheur, 2017 ³⁷ Companion Sub Study	OPT- Atrial fibrillation /flutter	6 minute hall walk distance	5	NR	6 months	5	NR	Mean change from baseline: 4	Reference
Kalscheur, 2017 ³⁷ Companion Sub Study	OPT-No atrial fibrillation /flutter	6 minute hall walk distance	5	NR	6 months	5	NR	Mean change from baseline: 0.4	Reference
Abraham,2002 ³² MIRACLE	Cardiac Resynchr onization Group	6 minute hall walk distance Unit:	228	Mean: 305 SD: 85	6 months	214	NR	39	NR
Abraham,2002 ³² MIRACLE	Control group	6 minute hall walk distance Unit:	225	Mean: 291 SD: 101	6 months	198	NR	10	NR

Table D11: Outcomes reported in the trials assessing effectiveness of CRT P (continued)

Author,Year Trial	Arm(name)	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Leclercq,2007 ⁷⁸ RD-CHF Study	All Patients	6 minute hall walk distance Unit:m	29	Mean: 324 SD: 149	3 months	29	386	NR	NR
Leclercq,2007 ⁷⁸ RD-CHF Study	BiV First	6 minute hall walk distance Unit:m	17	Mean: 316 SD: 25	3 months	17	358	NR	NR
Leclercq,2007 ⁷⁸ RD-CHF Study	RV Pacing First	6 minute hall walk distance Unit:m	12	Mean: 332 SD: 173	3 months	17	414	NR	NR
Minnesota Living with Heart Failure Inventory Score									
Abraham,2002 ³² MIRACLE	Cardiac Resynchro nization Group	Minnesot a Living with Heart Failure Inventory Score Unit:	228	Mean: 59 SD: 20	6 months	213	NR	-18	NR
Abraham,2002 ³² MIRACLE	Control group	Minnesot a Living with Heart Failure Inventory Score Unit:	225	Mean: 59 SD: 21	6 months	193	NR	-9	NR

Table D11: Outcomes reported in the trials assessing effectiveness of CRT P (continued)

Author,Year Trial	Arm(nam e)	Outcome Units	Baselin e N	Baselin e Outco me	Timepoi nt	N at Timepoi nt	Outcome at Timepoi nt	Within Arm Compariso ns	Between Arm Compariso ns
CARE HF Sub Study	CRT Non IHD	Minnesot a Living with Heart Failure Inventory Score Unit:	223	NR	3 months	NR	Mean: 41.5 SD: 20.49	NR	NR
CARE HF Sub Study	Medical therapy IHD	Minnesot a Living with Heart Failure Inventory Score Unit:	153	NR	3 months	NR	Mean: 35.56 SD: 21.68	NR	NR
CARE HF Sub Study	Medical therapy Non IHD	Minnesot a Living with Heart Failure Inventory Score Unit:	250	NR	3 months	NR	Mean: 30.25 SD: 22	NR	NR
Cleland,2004 ¹ CARE HF	Medical Therapy Alone	Minnesot a Living with Heart Failure Inventory Score Unit:	404	NR	90 days	404	Mean: 40 SD: 22	NR	HR: -10 95%CI: -8 to -12

Table D11: Outcomes reported in the trials assessing effectiveness of CRT P (continued)

Author,Year Trial	Arm(nam e)	Outcome Units	Baselin e N	Baselin e Outco me	Timepoi nt	N at Timepoi nt	Outcome at Timepoi nt	Within Arm Compariso ns	Between Arm Compariso ns
Cleland,2004 ¹ CARE HF	Medical therapy plus cardiac resynchro nization	Minnesot a Living with Heart Failure Inventory Score Unit:	409	NR	90 days	409	Mean: 31 SD: 22	NR	NA
Wikstrom,2009 ⁸ CARE HF Sub Study	CRT IHD	Minnesot a Living with Heart Failure Inventory Score Unit:	186	NR	3 months	NR	Mean: 31.29 SD: 19.74	NR	NR
Left ventricular end systolic volume									
Sutton,2003 ³³ MIRACLE Sub Study	Control group	Left ventricula r end systolic volume Unit:ml	151	Mean: 227.5 SD: 98.6	3 months	151	NR	0.6	NR
Sutton,2003 ³³	Control group	Left ventricula r end systolic volume Unit:ml	151	Mean: 227.5 SD: 98.6	6 months	151	NR	0.3	NR

Table D11: Outcomes reported in the trials assessing effectiveness of CRT P (continued)

Author,Year Trial	Arm(name)	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Sutton,2003 ³³ MIRACLE Sub Study	CRT group	Left ventricular end systolic volume Unit:ml	172	Mean: 227.7 SD: 93.7	3 months	172	NR	-21.8	NR
Sutton,2003 ³³	CRT group	Left ventricular end systolic volume Unit:ml	172	Mean: 227.7 SD: 93.7	6 months	172	NR	-25.6	NR
Wikstrom,2009 ⁸ CARE HF Sub Study	CRT IHD	Left ventricular end systolic volume Unit:ml	186	NR	3 months	NR	Mean: 193.99 SD: 69.36	NR	NR
Wikstrom,2009 ⁸ CARE HF Sub Study	CRT Non IHD	Left ventricular end systolic volume Unit:ml	223	NR	3 months	NR	Mean: 194.01 SD: 104.74	NR	NR
Wikstrom,2009 ⁸ CARE HF Sub Study	Medical therapy IHD	Left ventricular end systolic volume Unit:ml	153	NR	3 months	NR	Mean: 233.18 SD: 98.36	NR	NR

Table D11: Outcomes reported in the trials assessing effectiveness of CRT P (continued)

Author,Year Trial	Arm(name)	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Wikstrom,2009 ⁸ CARE HF Sub Study	Medical therapy Non IHD	Left ventricula r end systolic volume Unit:ml	250	NR	3 months	NR	Mean: 231.54 SD: 86.05	NR	NR
Left ventricular end diastolic volume									
Sutton,2003 ³³ MIRACLE Sub Study	Control group	Left ventricula r end diastolic volume Unit:ml	151	Mean: 293.9 SD: 105.1	3 months	151	NR	Mean Difference: 2.8	NR
Sutton,2003 ³³ MIRACLE Sub Study	Control group	Left ventricula r end diastolic volume Unit:ml	151	Mean: 293.9 SD: 105.1	6 months	151	NR	Mean Difference: 4.7	NR
Sutton,2003 ³³ MIRACLE Sub Study	CRT group(CR T-P)	Left ventricula r end diastolic volume Unit:ml	172	Mean: 295.6 SD: 102.6	3 months	172	NR	Mean Difference: -22.6	NR
Sutton,2003 ³³ MIRACLE Sub Study	CRT group(CR T-P)	Left ventricula r end diastolic volume Unit:ml	172	Mean: 295.6 SD: 102.6	6 months	172	NR	Mean Difference: -27.2	NR

Table D11: Outcomes reported in the trials assessing effectiveness of CRT P (continued)

Author,Year Trial	Arm(nam e)	Outcome Units	Baselin e N	Baselin e Outco me	Timepoi nt	N at Timepoi nt	Outcome at Timepoi nt	Within Arm Compariso ns	Between Arm Compariso ns
Left ventricular ejection fraction									
Abraham,2002 ³² MIRACLE	Cardiac Resynchr onization Group	Left ventricula r ejection fraction Unit:%	228	Mean: 21.8 SD: 6.3	6 months	155	NR	4.6	NR
Abraham,2002 ³² MIRACLE	Control group	Left ventricula r ejection fraction Unit:%	225	Mean: 21.6 SD: 6.2	6 months	146	NR	-0.2	NR
Leclercq,2007 ⁷⁸ RD-CHF Study	All Patients	Left ventricula r ejection fraction Unit:%	30	Mean: 29.5 SD: 11	3 months	30	Mean: 29 SD: 11	NR	NR
Leclercq,2007 ⁷⁸ RD-CHF Study	BiV First	Left ventricula r ejection fraction Unit:%	18	Mean: 32 SD: 11	3 months	18	Mean: 34 SD: 12	NR	NR
Leclercq,2007 ⁷⁸ RD-CHF Study	RV Pacing First	Left ventricula r ejection fraction Unit:%	12	Mean: 32 SD: 13	3 months	12	Mean: 37 SD: 11	NR	NR

Table D11: Outcomes reported in the trials assessing effectiveness of CRT P (continued)

Author,Year Trial	Arm(name)	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Sutton,2003 ³³ MIRACLE Sub Study	Control group	Left ventricula r ejection fraction Unit:%	151	Mean: 24.3 SD: 6.8	3 months	151	NR	0.6	NR
Sutton,2003 ³³ MIRACLE Sub Study	Control group	Left ventricula r ejection fraction Unit:%	151	Mean: 24.3 SD: 6.8	6 months	151	NR	0.4	NR
Sutton,2003 ³³ MIRACLE Sub Study	CRT group	Left ventricula r ejection fraction Unit:%	172	Mean: 24.5 SD: 6.8	3 months	172	NR	2.3	NR
Sutton,2003 ³³ MIRACLE Sub Study	CRT group	Left ventricula r ejection fraction Unit:%	172	Mean: 24.5 SD: 6.8	6 months	172	NR	3.6	NR
Wikstrom,2009 ⁸ CARE HF Sub Study	CRT IHD	Left ventricula r ejection fraction Unit:%	186	NR	3 months	NR	Mean: 29.08 SD: 6.9	NR	NR

Table D11: Outcomes reported in the trials assessing effectiveness of CRT P (continued)

Author,Year Trial	Arm(nam e)	Outcome Units	Baselin e N	Baselin e Outco me	Timepoi nt	N at Timepoi nt	Outcome at Timepoi nt	Within Arm Compariso ns	Between Arm Compariso ns
Wikstrom,2009 ⁸ CARE HF Sub Study	CRT Non IHD	Left ventricula r ejection fraction Unit:%	223	NR	3 months	NR	Mean: 30.59 SD: 8.19	NR	NR
Wikstrom,2009 ⁸ CARE HF Sub Study	Medical therapy IHD	Left ventricula r ejection fraction Unit:%	153	NR	3 months	NR	Mean: 26.56 SD: 6.92	NR	NR
Wikstrom,2009 ⁸ CARE HF Sub Study	Medical therapy Non IHD	Left ventricula r ejection fraction Unit:%	250	NR	3 months	NR	Mean: 26.31 SD: 6.5	NR	NR

CRT-P=Cardiac Resynchronization Therapy Paced, CRT-D=Cardiac Resynchronization Therapy with Defibrillator, ICD=Implantable Cardioverter Defibrillator, N=Number, HR=Hazard Ratio, CI=Confidence Interval, OR=Odds Ratio, RD=Risk Difference, P=P value, NA=Not Applicable, LBBB=Left Bundle Branch Block, LVEF=Left Ventricular Ejection Fraction, CABG=Coronary Artery Bypass Graft, CRT=Cardiac Resynchronization Therapy, Biv=Bi-Ventricular, RV=Right Ventricular, IHD=Ischemic Heart Disease, NR=Not Reported, SD=Standard Deviation, NA=Not Applicable

Table D12: Outcomes reported in the trials assessing effectiveness of CRT-P(Hospitalization for heart failure and All-cause mortality)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Hospitalization for heart failure								
Abraham,2002 ³² MIRACLE	Cardiac Resynchronization Group	Hospitalization for heart failure	228	6 months	18(7.9)	NR	NR	NA
Abraham,2002 ³² MIRACLE	Control group	Hospitalization for heart failure	225	6 months	34(15.1)	NR	NR	HR: 0.5 95% CI: 0.28 to 0.88
Cleland,2004 ¹ CARE HF	Medical Therapy Alone	Hospitalization for heart failure	404	18 months	184(46)	NR	NR	HR: 0.61 95%CI: 0.49 to 0.77
Cleland,2004 ¹ CARE HF	Medical therapy plus cardiac resynchronization	Hospitalization for heart failure	409	18 months	125(31)	NR	NR	NA
Leclercq,2007 ⁷⁸ RD-CHF Study	BiV First	Hospitalization for heart failure	NR	3 months	1(NR)	NR	NR	NR
Leclercq,2007 ⁷⁸ RD-CHF Study	RV First	Hospitalization for heart failure	NR	3 months	9(NR)	NR	NR	NR
All-cause mortality								
Abraham,2002 ³² MIRACLE	Cardiac Resynchronization Group	All-cause mortality	228	6 months	12(5.3)	NR	NR	NR

**Table D12: Outcomes reported in the trials assessing effectiveness of CRT-P(Hospitalization for heart failure and All-cause mortality)
(continued)**

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Abraham,2002 ³² MIRACLE	Control group	All-cause mortality	225	6 months	16(7.1)	NR	NR	HR: 0.73 95% CI: 0.34,1.54
Cleland,2004 ¹ CARE HF	Medical Therapy Alone	All-cause mortality	404	18 months	120(30)	NR	NR	HR: 0.64 95% CI: 0.48 - 0.85
Cleland,2004 ¹ CARE HF	Medical therapy plus cardiac resynchronization	All-cause mortality	409	18 months	82(20)	NR	NR	NR
Cleland,2006 ² CARE HF Sub Study	CRT	All-cause mortality	409	18 months	101(24.7)	NR	NR	NR
Cleland,2006 ² CARE HF Sub Study	Medical Therapy Alone	All-cause mortality	404	18 months	154(38.1)	NR	NR	HR: 0.6 95% CI: 0.47-0.77
Cleland,2007 ³ CARE HF Sub Study	CRT	All-cause mortality	409	NR	101(25)	NR	NR	NR
Cleland,2007 ³ CARE HF Sub Study	Medical Therapy	All-cause mortality	404	NR	154(38)	NR	NR	HR: 0.6 95% CI: 0.47-0.77

**Table D12: Outcomes reported in the trials assessing effectiveness of CRT-P(Hospitalization for heart failure and All-cause mortality)
(continued)**

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Cleland,2012 ⁵ CARE HF Sub Study	CRT	All-cause mortality	409	18 months	101(24.7)	NR	NR	NR
Cleland,2012 ⁵ CARE HF Sub Study	No CRT	All-cause mortality	404	18 months	154(38.1)	NR	NR	HR: 0.6 95% CI: 0.47-0.77
Kalscheur, 2017 ³⁷ COMPANION study	CRT-D, Atrial fibrillation/flutter	All-cause mortality	112	990 days	NR	NR	NR	HR: 0.94 95% CI: 0.49 to 1.80, p=0.85
Kalscheur, 2017 ³⁷ COMPANION study	CRT-D, No atrial fibrillation/flutter	All-cause mortality	353	990 days	NR	NR	NR	HR: 0.66 95% CI: 0.44 to 0.98, p=0.04
Kalscheur, 2017 ³⁷ COMPANION study	CRT-P, Atrial fibrillation/flutter	All-cause mortality	120	990 days	NR	NR	NR	HR: 1.28 95% CI: 0.69 to 2.35, p=0.44
Kalscheur, 2017 ³⁷ COMPANION study	CRT-P, No atrial fibrillation/flutter	All-cause mortality	362	990 days	NR	NR	NR	HR: 0.67 95% CI: 0.45 to 0.99, p=0.04
Kalscheur, 2017 ³⁷ COMPANION study	OPT, Atrial fibrillation/flutter	All-cause mortality	61	990 days	NR	NR	NR	Reference
Kalscheur, 2017 ³⁷ COMPANION study	OPT, No atrial fibrillation/flutter	All-cause mortality	172	990 days	NR	NR	NR	Reference
Kalscheur, 2017 ³⁷ COMPANION study	OPT, No atrial fibrillation/flutter	All-cause mortality	172	990 days	NR	NR	NR	Reference
Kalscheur, 2017 ³⁷ COMPANION study	OPT-Atrial fibrillation/flutter	All-cause mortality	61	990 days	NR	NR	NR	Reference

**Table D12: Outcomes reported in the trials assessing effectiveness of CRT-P(Hospitalization for heart failure and All-cause mortality)
(continued)**

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Leclercq,2007 ⁷⁸ RD-CHF Study	Overall	All-cause mortality	NR	6 months	NR(13.5)	NR	NR	NR
Wikstrom,2009 ⁸ CARE HF Sub Study	IHD	All-cause mortality	NR	18 months	NR	NR	NR	HR: 0.54 95% CI: 0.39- 0.76
Wikstrom,2009 ⁸ CARE HF Sub Study	Non IHD	All-cause mortality	NR	18 months	NR	NR	NR	HR: 0.56 95% CI: 0.37- 0.83

CRT-P=Cardiac Resynchronization Therapy Paced, CRT-D=Cardiac Resynchronization Therapy with Defibrillator, ICD=Implantable Cardioverter Defibrillator, N=Number, HR=Hazard Ratio, CI=Confidence Interval, OR=Odds Ratio, RD=Risk Difference, P=P value, NA=Not Applicable, LBBB=Left Bundle Branch Block, LVEF=Left Ventricular Ejection Fraction, CABG=Coronary Artery Bypass Graft, CRT=Cardiac Resynchronization Therapy, Biv=Bi-Ventricular, RV=Right Ventricular, IHD=Ischemic Heart Disease, NR=Not Reported, SD=Standard Deviation, NA=Not Applicable

Table D13: Harms reported in the studies assessing harms of CRT P

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Procedure related complications								
Garikipati,2014 ⁶⁰	Overall	Procedure related complications -not specified	21	12 months	NR	NR	NR	NR
Krahn,2002 ⁷³	Overall	Procedure related complications -not specified	45	NR	15(33.3)	NR	NR	NR
Length of hospital stay								
Garikipati,2014 ⁶⁰	Overall	Length of hospital stay 3Days	21	12 months	NR	NR	NR	NR
Cleland,2009 ⁴ CARE HF Sub Study	Medical Therapy alone	Length of hospital stay 3.4Days	404	3 months	NR	NR	NR	NR
Cleland,2009 ⁴ CARE HF Sub Study	CRT-P	Length of hospital stay 7.5Days	409	3 months	NR	NR	NR	NR
Pneumothorax								
Cleland,2004 ¹ CARE HF	Medical Therapy plus CRT (CRT-P)	Pneumothorax	409	18 MONTHS	6(NR)	NR	NR	NR
Gras,2007 ⁷ CARE HF Sub Study	CRT GROUP	Pneumothorax	404	24 HRS	2(0.5)	NR	NR	NR
Pocket hematoma								
Garikipati,2014 ⁶⁰	Overall	Pocket hematoma	21	12 months	NR	NR	NR	NR
Gras,2007 ⁷ CARE HF Sub Study	CRT GROUP	Pocket hematoma	404	30 DAYS	0(0)	NR	NR	NR
Mortensen,2004 ⁸⁴	Overall	Pocket hematoma	189	NR	2(1.1)	NR	NR	NR

Table D13: Harms reported in the studies assessing harms of CRT P (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Device infection								
Cleland,2004 ¹ CARE HF	Medical Therapy plus CRT (CRT-P)	Device Infection	409	18 MONTHS	3(NR)	NR	NR	NR
Garikipati,2014 ⁶⁰	Overall	Device Infection	21	12 months	1(4.8)	NR	NR	NR
Gras,2002 ⁶³	Overall	Device Infection	117	NR	1(0.85)	NR	NR	NR
Gras,2007 ⁷ CARE HF Sub Study	CRT GROUP	Device Infection	404	30 DAYS	3(0.74)	NR	NR	NR
Cardiac perforation/tamponade								
Cock,2003 ⁵²	Overall	Cardiac perforation/ tamponade	7	2-3 months	0(0)	0(0)	NR	NR
Gras,2002 ⁶³	Overall	Cardiac perforation/ tamponade	117	During procedure	1(0.85)	NR	NR	NR
Lead dislodgement								
Cleland,2004 ¹ CARE HF	Medical Therapy plus CRT (CRT-P)	Lead dislodgement	409	18 MONTHS	24(NR)	NR	NR	NR
Gras,2002 ⁶³	Overall	Lead dislodgement	117	NR	16(13.7)	NR	NR	NR
Gras,2007 ⁷ CARE HF Sub Study	CRT GROUP	Lead dislodgement	404	30 DAYS	11(2.7)	NR	NR	NR
Hong-xia,2006 ⁶⁷	Overall	Lead dislodgement	117	NR	2(1.71)	NR	NR	NR
Krahn,2002 ⁷³	Overall	Lead dislodgement	45	NR	3(6.7)	NR	NR	NR
Mortensen,2004 ⁸⁴	Overall	Lead dislodgement	189	NR	12(6.4)	NR	NR	NR
Stahlberg,2005 ⁹⁵	Overall	Lead dislodgement	35	NR	6(17)	NR	NR	NR

Table D13: Harms reported in the studies assessing harms of CRT P (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Death within a week								
Krahn,2002 ⁷³	Overall	Death (within a week)	45	NR	1(2.2)	NR	NR	NR

CRT-P=Cardiac Resynchronization Therapy Paced, CRT-D=Cardiac Resynchronization Therapy with Defibrillator, ICD=Implantable Cardioverter Defibrillator, N=Number, HR=Hazard Ratio, CI=Confidence Interval, OR=Odds Ratio, RD=Risk Difference, P=P value, NA=Not Applicable, LBBB=Left Bundle Branch Block, LVEF=Left Ventricular Ejection Fraction, CABG=Coronary Artery Bypass Graft, CRT=Cardiac Resynchronization Therapy, Biv=Bi-Ventricular, RV=Right Ventricular, IHD=Ischemic Heart Disease, NR=Not Reported, SD=Standard Deviation, NA=Not Applicable

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
6 minute hall walk distance									
Abraham,2004 ⁴¹ MIRACLE ICD II	Control	6 minute hall walk distance Unit:Meters	101	Mean: 383 SD: 108	6 months	93	Mean: 33 SD: 98	33	NR
Abraham,2004 ⁴¹ MIRACLE ICD II	CRT	6 minute hall walk distance Unit:Meters	85	Mean: 355 SD: 125	6 months	78	Mean: 38 SD: 109	38	NR
Higgins,2003 ⁶⁵ VENTAK CHF/CONTAK CD	CRT	6 minute hall walk distance Unit:Meters	245	Mean: 316 SD: 119	6 months	224	NR	35	NR
Higgins,2003 ⁶⁵ VENTAK CHF/CONTAK CD	No CRT	6 minute hall walk distance Unit:Meters	245	Mean: 320 SD: 121	6 months	220	NR	15	NR
Young,2003 ³¹ MIRACLE ICD	Control	6 minute hall walk distance Unit:Meters	182	Mean: 243 SD: 117	6 months	153	NR	53	NR
Young,2003 ³¹ MIRACLE ICD	CRT	6 minute hall walk distance Unit:Meters	187	Mean: 243 SD: 129	6 months	152	NR	55	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Healey,2012 ²⁹	ICD	6 minute hall walk distance Unit:Meters	68	Mean: 343 SD: 108	12	68	Mean: 360 SD: 122	16 +/- 76	NR
Healey,2012 ²⁹	CRT-ICD	6 minute hall walk distance Unit:Meters	69	Mean: 334 SD: 92	12	69	Mean: 353 SD: 113	19 +/- 84	NR
Pinter,2009 ⁸⁸	CRT ON	6 minute hall walk distance Unit:Meters	36	Mean: 314 SD: 114	6 months	36	NR	Mean change from baseline 53.3	NR
Pinter,2009 ⁸⁸	CRT OFF	6 minute hall walk distance Unit:Meters	36	Mean: 338 SD: 110	6 months	36	NR	Mean change from baseline 27.3	NR
Minnesota Living with Heart Failure Inventory Score									
Healey,2012 ²⁹	ICD	Minnesota Living with Heart Failure Inventory Score Unit:NA	95	Mean: 33 SD: 20	12 months	95	Mean: 28 SD: 20	-5 +/- 21	NR
Healey,2012 ²⁹	CRT-ICD	Minnesota Living with Heart Failure Inventory Score Unit:NA	101	Mean: 41 SD: 21	12 months	101	Mean: 31 SD: 21	-11 +/- 18	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Pinter,2009 ⁸⁸	CRT ON	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 42.3 SD: 20.8	6 months	36	NR	Mean change from baseline -7.8	NR
Pinter,2009 ⁸⁸	CRT OFF	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 42.8 SD: 24.9	6 months	36	NR	Mean change from baseline -0.2	NR
Pinter,2009 ⁸⁸	CRT ON	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 20.1 SD: 9.2	6 months	36	NR	Mean change from baseline -5	NR
Pinter,2009 ⁸⁸	CRT OFF	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 17.7 SD: 9.8	6 months	36	NR	Mean change from baseline -0.6	NR
Pinter,2009 ⁸⁸	CRT ON	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 8.5 SD: 6.4	6 months	36	NR	Mean change from baseline -1.3	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Pinter,2009 ⁸⁸	CRT OFF	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 9.1 SD: 7.6	6 months	36	NR	Mean change from baseline 0.3	NR
Pinter,2009 ⁸⁸	CRT ON	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 46.7 SD: 24.9	6 months	36	NR	11.2	NR
Pinter,2009 ⁸⁸	CRT OFF	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 44.5 SD: 26.5	6 months	36	NR	6.3	NR
Pinter,2009 ⁸⁸	CRT ON	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 14 SD: 26.9	6 months	36	NR	19.6	NR
Pinter,2009 ⁸⁸	CRT OFF	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 12.4 SD: 23.9	6 months	36	NR	21.6	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Pinter,2009 ⁸⁸	CRT ON	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 93 SD: 11.4	6 months	36	NR	-3.3	NR
Pinter,2009 ⁸⁸	CRT OFF	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 95.3 SD: 11	6 months	36	NR	-2.3	NR
Pinter,2009 ⁸⁸	CRT ON	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 59.4 SD: 12.7	6 months	36	NR	-5.8	NR
Pinter,2009 ⁸⁸	CRT OFF	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 59 SD: 9.6	6 months	36	NR	-5.8	NR
Pinter,2009 ⁸⁸	CRT ON	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 43.9 SD: 19.4	6 months	36	NR	1.4	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Pinter,2009 ⁸⁸	CRT OFF	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 42.8 SD: 25.2	6 months	36	NR	1.3	NR
Pinter,2009 ⁸⁸	CRT ON	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 59.4 SD: 27.1	6 months	36	NR	4.7	NR
Pinter,2009 ⁸⁸	CRT OFF	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 61.7 SD: 29	6 months	36	NR	2.6	NR
Pinter,2009 ⁸⁸	CRT ON	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 46.7 SD: 46	6 months	36	NR	12.5	NR
Pinter,2009 ⁸⁸	CRT OFF	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 54 SD: 47.5	6 months	36	NR	5.4	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Pinter,2009 ⁸⁸	CRT ON	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 65.3 SD: 20	6 months	36	NR	29.5	NR
Pinter,2009 ⁸⁸	CRT OFF	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 69 SD: 22.9	6 months	36	NR	3.3	NR
Pinter,2009 ⁸⁸	CRT ON	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 39.5 SD: 5.7	6 months	36	NR	4.5	NR
Pinter,2009 ⁸⁸	CRT OFF	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 39.1 SD: 5.7	6 months	36	NR	0.1	NR
Pinter,2009 ⁸⁸	CRT ON	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 43.7 SD: 11.6	6 months	36	NR	5.1	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Pinter,2009 ⁸⁸	CRT OFF	Minnesota Living with Heart Failure Inventory Score Unit:NA	36	Mean: 46 SD: 13.7	6 months	36	NR	0.5	NR
Diab,2011 ⁵⁴	Arm 1	Minnesota Living with Heart Failure Inventory Score Unit:NA	27	Mean: 22 SD: 7	6 months	26	Mean: 26 SD: 9	NR	NR
Diab,2011 ⁵⁴	Arm 2	Minnesota Living with Heart Failure Inventory Score Unit:NA	46	Mean: SD:			Mean: SD:	NR	NR
Diab,2011 ⁵⁴	Arm 3	Minnesota Living with Heart Failure Inventory Score Unit:NA	24	Mean: 43 SD: 25	6 months	21	Mean: 27 SD: 21	NR	NR
Diab,2011 ⁵⁴	Arm 4	Minnesota Living with Heart Failure Inventory Score Unit:NA	22	Mean: 42 SD: 21	6 months	UNCLEAR (19?)	Mean: 44 SD: 27	NR	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Abraham,2004 ⁴¹ MIRACLE ICD II	Control	Minnesota Living with Heart Failure Inventory Score Unit:NA	101	Mean: 39.8 SD: 21.2	6 months	96	NR	"-10.7(mean difference)	NR
Abraham,2004 ⁴¹ MIRACLE ICD II	CRT	Minnesota Living with Heart Failure Inventory Score Unit:NA	85	Mean: 41.8 SD: 25.1	6 months	81	NR	"-13.3(mean difference)	NR
Higgins,2003 ⁶⁵ VENTAK CHF/CONTAK CD	CRT(Overall)	Minnesota Living with Heart Failure Inventory Score Unit:NA	245	Mean: 44 SD: 25	6 months	234	NR	-7	NR
VENTAK CHF/CONTAK CD	No CRT(Overall)	Minnesota Living with Heart Failure Inventory Score Unit:NA	245	Mean: 40 SD: 23	6 months	220	NR	5	NR
Higgins,2003 ⁶⁵ VENTAK CHF/CONTAK CD	CRT(Class III/IV)	Minnesota Living with Heart Failure Inventory Score Unit:NA	117	Mean: 56 SD: 22	6 months	107	NR	-16	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Higgins,2003 ⁶⁵ VENTAK CHF/CONTAK CD	No CRT(Class III/IV)	Minnesota Living with Heart Failure Inventory Score Unit:NA	110	Mean: 49 SD: 21	6 months	96	NR	-5	NR
Higgins,2003 ⁶⁵ VENTAK CHF/CONTAK CD	CRT(Class I/II)	Minnesota Living with Heart Failure Inventory Score Unit:NA	128	NR	6 months	127	NR	-1	NR
Higgins,2003 ⁶⁵ VENTAK CHF/CONTAK CD	No CRT(Class I/II/)	Minnesota Living with Heart Failure Inventory Score Unit:NA	135	NR	6 months	129	NR	-4	NR
Young,2003 ³¹ MIRACLE ICD	Control	Minnesota Living with Heart Failure Inventory Score Unit:NA	182	Mean: 55.2 SD: 22.6	6 months	153	NR	-11	NR
Young,2003 ³¹ MIRACLE ICD	CRT	Minnesota Living with Heart Failure Inventory Score Unit:NA	187	Mean: 56.8 SD: 22.6	6 months	152	NR	-17.5	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
SF -36									
Pinter,2009 ⁸⁸	CRT ON	SF -36 Unit:NA	36	Mean: 46.7 SD: 24.9	6 months	36	NR	11.2	NR
	CRT OFF	SF -36 Unit:NA	36	Mean: 44.5 SD: 26.5	6 months	36	NR	6.3	NR
Pinter,2009 ⁸⁸	CRT ON	SF -36 Unit:NA	36	Mean: 14 SD: 26.9	6 months	36	NR	19.6	NR
	CRT OFF	SF -36 Unit:NA	36	Mean: 12.4 SD: 23.9	6 months	36	NR	21.6	NR
Pinter,2009 ⁸⁸	CRT ON	SF -36 Unit:NA	36	Mean: 93 SD: 11.4	6 months	36	NR	-3.3	NR
	CRT OFF	SF -36 Unit:NA	36	Mean: 95.3 SD: 11	6 months	36	NR	-2.3	NR
Pinter,2009 ⁸⁸	CRT ON	SF -36 Unit:NA	36	Mean: 59.4 SD: 12.7	6 months	36	NR	-5.8	NR
	CRT OFF	SF -36 Unit:NA	36	Mean: 59 SD: 9.6	6 months	36	NR	-5.8	NR
Pinter,2009 ⁸⁸	CRT ON	SF -36 Unit:NA	36	Mean: 43.9 SD: 19.4	6 months	36	NR	1.4	NR
	CRT OFF	SF -36 Unit:NA	36	Mean: 42.8 SD: 25.2	6 months	36	NR	1.3	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Pinter,2009 ⁸⁸	CRT ON	SF -36 Unit:NA	36	Mean: 59.4 SD: 27.1	6 months	36	NR	4.7	NR
	CRT OFF	SF -36 Unit:NA	36	Mean: 61.7 SD: 29	6 months	36	NR	2.6	NR
Pinter,2009 ⁸⁸	CRT ON	SF -36 Unit:NA	36	Mean: 46.7 SD: 46	6 months	36	NR	12.5	NR
	CRT OFF	SF -36 Unit:NA	36	Mean: 54 SD: 47.5	6 months	36	NR	5.4	NR
Pinter,2009 ⁸⁸	CRT ON	SF -36 Unit:NA	36	Mean: 65.3 SD: 20	6 months	36	NR	29.5	NR
	CRT OFF	SF -36 Unit:NA	36	Mean: 69 SD: 22.9	6 months	36	NR	3.3	NR
Pinter,2009 ⁸⁸	CRT ON	SF -36 Unit:NA	36	Mean: 39.5 SD: 5.7	6 months	36	NR	4.5	NR
	CRT OFF	SF -36 Unit:NA	36	Mean: 39.1 SD: 5.7	6 months	36	NR	0.1	NR
Pinter,2009 ⁸⁸	CRT ON	SF -36 Unit:NA	36	Mean: 43.7 SD: 11.6	6 months	36	NR	5.1	NR
	CRT OFF	SF -36 Unit:NA	36	Mean: 46 SD: 13.7	6 months	36	NR	0.5	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Left ventricular end systolic volume									
Abraham,2004 ⁴¹ MIRACLE ICD II	Control	Left ventricular end systolic volume Unit:ml	101	Mean: 252 SD: 98	6 months	85	NR	-14	NR
Abraham,2004 ⁴¹ MIRACLE ICD II	CRT	Left ventricular end systolic volume Unit:ml	85	Mean: 260 SD: 134	6 months	68	NR	-42	NR
Moss,2009 ⁹ MADIT CRT	ICD	Left ventricular end systolic volume Unit:ml	731	Mean: 179 SD: 53	1 year	620	NR	Mean change from baseline 18	NR
Moss,2009 ⁹ MADIT CRT	CRT-D	Left ventricular end systolic volume Unit:ml	1098	Mean: 175 SD: 48	1 year	746	NR	Mean change from baseline 57	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Young,2003 ³¹ MIRACLE ICD	Control	Left ventricular end systolic volume Unit:ml	182	NR	6 months	133	NR	-8.2	NR
Young,2003 ³¹ MIRACLE ICD	CRT	Left ventricular end systolic volume Unit:ml	187	NR	6 months	132	NR	-22.2	NR
Hsu,2012 ¹⁶	Hyporesponders	Left ventricular end systolic volume Unit:ml	187	Mean: 85.9 SD: 20.3	12 months	187	Mean: -12.6 SD: 10.7	NR	NR
Hsu,2012 ¹⁶	Responders	Left ventricular end systolic volume Unit:ml	367	Mean: 90.2 SD: 21.9	12 months	367	Mean: -29.8 SD: 10	NR	NR
Hsu,2012 ¹⁶	Super responders	Left ventricular end systolic volume Unit:ml	188	Mean: 87.6 SD: 20.6	12 months	188	Mean: 87.6 SD: 20.6	NR	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Pinter,2009 ⁸⁸	CRT ON	Left ventricular end systolic volume Unit:ml	36	Mean: 242 SD: 96	6 months	36	NR	-7	NR
Pinter,2009 ⁸⁸	CRT OFF	Left ventricular end systolic volume Unit:ml	36	Mean: 251 SD: 147	6 months	36	NR	-30	NR
Pinter,2009 ⁸⁸	CRT ON	Left ventricular end systolic volume Unit:ml	36	Mean: 217 SD: 72	6 months	36	NR	-21	NR
Pinter,2009 ⁸⁸	CRT OFF	Left ventricular end systolic volume Unit:ml	36	Mean: 213 SD: 101	6 months	36	NR	-5	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Solomon,2010 ²¹ MADIT CRT Sub Study	ICD	Left ventricular end systolic volume Unit:ml	623	Mean: 179.2 SD: 51.9	12 months	623	Mean: 161.2 SD: 49.8	-18.1	NR
Solomon,2010 ²¹ MADIT CRT Sub Study	CRT-D	Left ventricular end systolic volume Unit:ml	749	Mean: 177.2 SD: 44.9	12 months	749	Mean: 119.8 SD: 41.6	-57.3	NR
Tompkins,2013 ²³ MADIT CRT Sub Study	ICD	Left ventricular end systolic volume Unit:ml	87	Mean: 80 SD: 17.6	12 months	74	NR	NR	NR
Tompkins,2013 ²³ MADIT CRT Sub Study	CRT-D LAFB	Left ventricular end systolic volume Unit:ml	80	Mean: 77.5 SD: 17.7	12 months	48	NR	NR	Mean change (nonLFAB- LFAB): -7
Tompkins,2013 ²³ MADIT CRT Sub Study	CRT-D non-LAFB	Left ventricular end systolic volume Unit:ml	52	Mean: 76.4 SD: 15.7	12 months	31	NR	NR	Mean change (nonLFAB- ICD): -17

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Diab,2011 ⁵⁴	Arm 3	Left ventricular end systolic volume Unit:ml	24	Mean: 175 SD: 48	6 months	21	Mean: 158.4 SD: 56	NR	NR
Diab,2011 ⁵⁴	Arm 4	Left ventricular end systolic volume Unit:ml	22	Mean: 188 SD: 71	6 months	UNCLEAR (19?)	Mean: 169 SD: 46	NR	NR
Diab,2011 ⁵⁴	Arm 1	Left ventricular end systolic volume Unit:ml	27	Mean: 210 SD: 89	6 months	26	Mean: SD:	NR	NR
Arshad,2011 ¹⁰	ICD,Women	Left ventricular end systolic volume Unit:ml	154	NR	6 months	154	NR	Median change from baseline -10	NR
Arshad,2011 ¹⁰	ICD, Men	Left ventricular end systolic volume Unit:ml	469	NR	6 months	469	NR	Median change from baseline -8	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Arshad,2011 ¹⁰	CRT D Women	Left ventricular end systolic volume Unit:ml	184	NR	6 months	184	NR	Median change from baseline -31	NR
Arshad,2011 ¹⁰	CRT D Men	Left ventricular end systolic volume Unit:ml	565	NR	6 months	565	NR	Median change from baseline -27	NR
Arshad,2011 ¹⁰	ICD,Women, Ischemic heart disease	Left ventricular end systolic volume Unit:ml	40	NR	6 months	40	NR	Median change from baseline -11	NR
Arshad,2011 ¹⁰	ICD,men, Ischemic heart disease	Left ventricular end systolic volume Unit:ml	294	NR	6 months	294	NR	Median change from baseline -8	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Arshad,2011 ¹⁰	CRT D,Women, Ischemic heart disease	Left ventricular end systolic volume Unit:ml	52	NR	6 months	52	NR	Median change from baseline -28	NR
Arshad,2011 ¹⁰	CRT D,men, Ischemic heart disease	Left ventricular end systolic volume Unit:ml	359	NR	6 months	359	NR	Median change from baseline -25	NR
Arshad,2011 ¹⁰	ICD,Women, Non Ischemic heart disease	Left ventricular end systolic volume Unit:ml	114	NR	6 months	114	NR	Median change from baseline -9	NR
Arshad,2011 ¹⁰	ICD,men, Non Ischemic heart disease	Left ventricular end systolic volume Unit:ml	175	NR	6 months	175	NR	Median change from baseline -10	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Arshad,2011 ¹⁰	CRT D,Women, Non Ischemic heart disease	Left ventricular end systolic volume Unit:ml	132	NR	6 months	132	NR	Median change from baseline -33	NR
Arshad,2011 ¹⁰	CRT D,men, Non Ischemic heart disease	Left ventricular end systolic volume Unit:ml	206	NR	6 months	206	NR	Median change from baseline -31	NR
Arshad,2011 ¹⁰	ICD,Women, QRS <150ms	Left ventricular end systolic volume Unit:ml	45	NR	6 months	45	NR	Median change from baseline -9	NR
Arshad,2011 ¹⁰	ICD, Men,QRS <150ms	Left ventricular end systolic volume Unit:ml	166	NR	6 months	166	NR	Median change from baseline -8	NR
Arshad,2011 ¹⁰	CRT D Women,QRS <150ms	Left ventricular end systolic volume Unit:ml	58	NR	6 months	58	NR	Median change from baseline -27	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Arshad,2011 ¹⁰	CRT D Men,QRS <150ms	Left ventricular end systolic volume Unit:ml	200	NR	6 months	200	NR	Median change from baseline -23	NR
Arshad,2011 ¹⁰	ICD,Women, QRS >/=150ms	Left ventricular end systolic volume Unit:ml	109	NR	6 months	109	NR	Median change from baseline -10	NR
Arshad,2011 ¹⁰	ICD, Men,QRS >/=150ms	Left ventricular end systolic volume Unit:ml	303	NR	6 months	303	NR	Median change from baseline -8	NR
Arshad,2011 ¹⁰	CRT D Women,QRS >/=150ms	Left ventricular end systolic volume Unit:ml	126	NR	6 months	126	NR	Median change from baseline -36	NR
Arshad,2011 ¹⁰	CRT D Men,QRS >/=150ms	Left ventricular end systolic volume Unit:ml	365	NR	6 months	365	NR	Median change from baseline -29	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Arshad,2011 ¹⁰	ICD,Women,Non LBBB	Left ventricular end systolic volume Unit:ml	20	NR	6 months	20	NR	Median change from baseline -10	NR
Arshad,2011 ¹⁰	ICD, Men,Non LBBB	Left ventricular end systolic volume Unit:ml	159	NR	6 months	159	NR	Median change from baseline -9	NR
Arshad,2011 ¹⁰	CRT D Women,Non LBBB	Left ventricular end systolic volume Unit:ml	25	NR	6 months	25	NR	Median change from baseline -25	NR
Arshad,2011 ¹⁰	CRT D Men,Non LBBB	Left ventricular end systolic volume Unit:ml	192	NR	6 months	192	NR	Median change from baseline -22	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Arshad,2011 ¹⁰	ICD,Women,LBBB	Left ventricular end systolic volume Unit:ml	134	NR	6 months	134	NR	Median change from baseline -10	NR
Arshad,2011 ¹⁰	ICD, Men,LBBB	Left ventricular end systolic volume Unit:ml	309	NR	6 months	309	NR	Median change from baseline -8	NR
Arshad,2011 ¹⁰	CRT D Women,LBBB	Left ventricular end systolic volume Unit:ml	159	NR	6 months	159	NR	Median change from baseline -33	NR
Arshad,2011 ¹⁰	CRT D Men,LBBB	Left ventricular end systolic volume Unit:ml	373	NR	6 months	373	NR	Median change from baseline -29	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Zareba,2011 ²⁴ MADIT CRT Sub Study	ICD LBBB	Left ventricular end systolic volume Unit:ml	443	NR	6 months	443	NR	Mean change from baseline -18.3	NR
Zareba,2011 ²⁴ MADIT CRT Sub Study	ICD Non LBBB	Left ventricular end systolic volume Unit:ml	179	NR	6 months	179	NR	Mean change from baseline -17.5	NR
Zareba,2011 ²⁴ MADIT CRT Sub Study	CRT D LBBB	Left ventricular end systolic volume Unit:ml	532	NR	6 months	532	NR	Mean change from baseline -62.1	NR
Zareba,2011 ²⁴ MADIT CRT Sub Study	CRTD Non LBBB	Left ventricular end systolic volume Unit:ml	216	NR	6 months	216	NR	Mean change from baseline -45.7	NR
Zareba,2011 ²⁴ MADIT CRT Sub Study	ICD LBBB	Left ventricular end systolic volume Unit:ml	443	NR	6 months	443	NR	% change from baseline -10.1	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Zareba,2011 ²⁴ MADIT CRT Sub Study	ICD Non LBBB	Left ventricular end systolic volume Unit:ml	179	NR	6 months	179	NR	% change from baseline -10.2	NR
Zareba,2011 ²⁴ MADIT CRT Sub Study	CRT D LBBB	Left ventricular end systolic volume Unit:ml	532	NR	6 months	532	NR	% change from baseline -34.8	NR
Zareba,2011 ²⁴ MADIT CRT Sub Study	CRTD Non LBBB	Left ventricular end systolic volume Unit:ml	216	NR	6 months	216	NR	% change from baseline -26.3	NR
Barsheshet,20 11 ¹¹ MADIT CRT Sub Study	CRTD Ischemic Cardiomyopathy	Left ventricular end systolic volume Unit:ml	154	NR	6 months	154	NR	% change from baseline -29	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Barsheshet,20 11 ¹¹ MADIT CRT Sub Study	CRTD Non Ischemic Cardiomyopathy	Left ventricular end systolic volume Unit:ml	477	NR	6 months	477	NR	% change from baseline -37	NR
Barsheshet,20 11 ¹¹ MADIT CRT Sub Study	ICD Ischemic Cardiomyopathy	Left ventricular end systolic volume Unit:ml	194	NR	6 months	194	NR	% change from baseline -10	NR
Barsheshet,20 11 ¹¹ MADIT CRT Sub Study	ICD Non Ischemic Cardiomyopathy	Left ventricular end systolic volume Unit:ml	592	NR	6 months	592	NR	% change from baseline -11	NR
Left ventricular end diastolic volume/ volume index									
Abraham,2004 ⁴¹ MIRACLE ICD II	Control	Left ventricular end diastolic volume/ volume index Unit:ml	101	Mean: 329 SD: 108	6 months	85	NR	-16	NR
Abraham,2004 ⁴¹ MIRACLE ICD II	CRT	Left ventricular end diastolic volume/ volume index Unit:ml	85	Mean: 337 SD: 147	6 months	69	NR	-41	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Moss,2009 ⁹	ICD	Left ventricular end diastolic volume/ volume index Unit:ml	731	Mean: 251 SD: 65	1 year	620	NR	Mean change from baseline 15	NR
Abraham,2004 ⁴¹ MIRACLE ICD II	CRT-D	Left ventricular end diastolic volume/ volume index Unit:ml	1098	Mean: 245 SD: 60	1 year	746	NR	Mean change from baseline 52	NR
Moss,2009 ⁹	Control	Left ventricular end diastolic volume/ volume index Unit:ml	188	Mean: 311 SD: 96	6 months	133	NR	-5.7	NR
Moss,2009 ⁹	CRT	Left ventricular end diastolic volume/ volume index Unit:ml	187	Mean: 322 SD: 100	6 months	132	NR	-19.9	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Hsu,2012 ¹⁶	Hyporesponders	Left ventricular end diastolic volume/ volume index Unit:ml	187	Mean: 122.5 SD: 25.5	12 months	187	Mean: -11.2 SD: 10.1	NR	NR
Hsu,2012 ¹⁶	Responders	Left ventricular end diastolic volume/ volume index Unit:ml	367	Mean: 126.4 SD: 27	12 months	371	Mean: -26.5 SD: 11.8	NR	NR
Hsu,2012 ¹⁶	Super responders	Left ventricular end diastolic volume/ volume index Unit:ml	188	Mean: 124 SD: 24.7	12 months	191	Mean: -40.8 SD: 16.8	NR	NR
Pinter,2009 ⁸⁸	CRT ON	Left ventricular end diastolic volume/ volume index Unit:ml	36	Mean: 314 SD: 108	6 months	36	NR	-7	NR
Pinter,2009 ⁸⁸	CRT OFF	Left ventricular end diastolic volume/ volume index Unit:ml	36	Mean: 335 SD: 156	6 months	36	NR	-34	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Pinter,2009 ⁸⁸	CRT ON	Left ventricular end diastolic volume/ volume index Unit:ml	36	Mean: 270 SD: 74	6 months	36	NR	-16	NR
Pinter,2009 ⁸⁸	CRT OFF	Left ventricular end diastolic volume/ volume index Unit:ml	36	Mean: 272 SD: 106	6 months	36	NR	-13	NR
Solomom,2010 ²¹ MADIT CRT Sub Study	ICD	Left ventricular end diastolic volume/ volume index Unit:ml	623	Mean: 250.9 SD: 64.4	12 months	623	Mean: 236.2 SD: 63.5	-14.7	NR
Solomom,2010 ²¹ MADIT CRT Sub Study	CRT-D	Left ventricular end diastolic volume/ volume index Unit:ml	749	Mean: 249.9 SD: 55.6	12 months	749	Mean: 197.8 SD: 52.7	-52.2	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Tompkins,2013 ²³	ICD	Left ventricular end diastolic volume/ volume index Unit:ml	87	Mean: 113.5 SD: 22.4	12 months	74	NR	NR	NR
Tompkins,2013 ²³	CRT-D LAFB	Left ventricular end diastolic volume/ volume index Unit:ml	80	Mean: 110.5 SD: 22.8	12 months	48	NR	NR	Mean change (nonLFAB-LFAB): -5
Tompkins,2013 ²³	CRT-D non-LAFB	Left ventricular end diastolic volume/ volume index Unit:ml	52	Mean: 108.6 SD: 20.4	12 months	31	NR	NR	Mean change (nonLFAB-ICD): -11
Arshad,2011 ¹⁰	ICD,Women	Left ventricular end diastolic volume/ volume index Unit:ml	154	NR	6 months	154	NR	Median change from baseline -9	NR
Arshad,2011 ¹⁰	ICD, Men	Left ventricular end diastolic volume/ volume index Unit:ml	469	NR	6 months	469	NR	Median change from baseline -7	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Arshad,2011 ¹⁰	CRT D Women	Left ventricular end diastolic volume/ volume index Unit:ml	184	NR	6 months	184	NR	Median change from baseline -29	NR
Arshad,2011 ¹⁰	CRT D Men	Left ventricular end diastolic volume/ volume index Unit:ml	565	NR	6 months	565	NR	Median change from baseline -22	NR
Arshad,2011 ¹⁰	ICD,Women, Ischemic heart disease	Left ventricular end diastolic volume/ volume index Unit:ml	40	NR	6 months	40	NR	Median change from baseline -9	NR
Arshad,2011 ¹⁰	ICD,men, Ischemic heart disease	Left ventricular end diastolic volume/ volume index Unit:ml	294	NR	6 months	294	NR	Median change from baseline 6	NR
Arshad,2011 ¹⁰	CRT D,Women, Ischemic heart disease	Left ventricular end diastolic volume/ volume index Unit:ml	52	NR	6 months	52	NR	Median change from baseline -22	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Arshad,2011 ¹⁰	CRT D,men, Ischemic heart disease	Left ventricular end diastolic volume/ volume index Unit:ml	359	NR	6 months	359	NR	Median change from baseline -21	NR
Arshad,2011 ¹⁰	ICD,Women, Non Ischemic heart disease	Left ventricular end diastolic volume/ volume index Unit:ml	114	NR	6 months	114	NR	Median change from baseline -8	NR
Arshad,2011 ¹⁰	ICD,men, Non Ischemic heart disease	Left ventricular end diastolic volume/ volume index Unit:ml	175	NR	6 months	175	NR	Median change from baseline -7	NR
Arshad,2011 ¹⁰	CRT D,Women, Non Ischemic heart disease	Left ventricular end diastolic volume/ volume index Unit:ml	132	NR	6 months	132	NR	Median change from baseline -30	NR
Arshad,2011 ¹⁰	CRT D,men, Non Ischemic heart disease	Left ventricular end diastolic volume/ volume index Unit:ml	206	NR	6 months	206	NR	Median change from baseline -28	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Arshad,2011 ¹⁰	ICD,Women, QRS <150ms	Left ventricular end diastolic volume/ volume index Unit:ml	45	NR	6 months	45	NR	Median change from baseline -7	NR
Arshad,2011 ¹⁰	ICD, Men,QRS <150ms	Left ventricular end diastolic volume/ volume index Unit:ml	166	NR	6 months	166	NR	Median change from baseline -7	NR
Arshad,2011 ¹⁰	CRT D Women,QRS <150ms	Left ventricular end diastolic volume/ volume index Unit:ml	58	NR	6 months	58	NR	Median change from baseline -23	NR
Arshad,2011 ¹⁰	CRT D Men,QRS <150ms	Left ventricular end diastolic volume/ volume index Unit:ml	200	NR	6 months	200	NR	Median change from baseline -19	NR
Arshad,2011 ¹⁰	ICD,Women, QRS >/=150ms	Left ventricular end diastolic volume/ volume index Unit:ml	109	NR	6 months	109	NR	Median change from baseline -9	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Arshad,2011 ¹⁰	ICD, Men,QRS >=150ms	Left ventricular end diastolic volume/ volume index Unit:ml	303	NR	6 months	303	NR	Median change from baseline -7	NR
Arshad,2011 ¹⁰	CRT D Women,QRS >=150ms	Left ventricular end diastolic volume/ volume index Unit:ml	126	NR	6 months	126	NR	Median change from baseline -32	NR
Arshad,2011 ¹⁰	CRT D Men,QRS >=150ms	Left ventricular end diastolic volume/ volume index Unit:ml	365	NR	6 months	365	NR	Median change from baseline -25	NR
Arshad,2011 ¹⁰	ICD,Women,Non LBBB	Left ventricular end diastolic volume/ volume index Unit:ml	20	NR	6 months	20	NR	Median change from baseline -9	NR
Arshad,2011 ¹⁰	ICD, Men,Non LBBB	Left ventricular end diastolic volume/ volume index Unit:ml	159	NR	6 months	159	NR	Median change from baseline -7	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Arshad,2011 ¹⁰	CRT D Women,Non LBBB	Left ventricular end diastolic volume/ volume index Unit:ml	25	NR	6 months	25	NR	Median change from baseline -20	NR
Arshad,2011 ¹⁰	CRT D Men,Non LBBB	Left ventricular end diastolic volume/ volume index Unit:ml	192	NR	6 months	192	NR	Median change from baseline -19	NR
Arshad,2011 ¹⁰	ICD,Women,LBBB	Left ventricular end diastolic volume/ volume index Unit:ml	134	NR	6 months	134	NR	Median change from baseline -8	NR
Arshad,2011 ¹⁰	ICD, Men,LBBB	Left ventricular end diastolic volume/ volume index Unit:ml	309	NR	6 months	309	NR	Median change from baseline -6	NR
Arshad,2011 ¹⁰	CRT D Women,LBBB	Left ventricular end diastolic volume/ volume index Unit:ml	159	NR	6 months	159	NR	Median change from baseline -30	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Arshad,2011 ¹⁰	CRT D Men,LBBB	Left ventricular end diastolic volume/ volume index Unit:ml	373	NR	6 months	373	NR	Median change from baseline -25	NR
Zareba,2011 ²⁴ MADIT CRT Sub Study	ICD LBBB	Left ventricular end diastolic volume/ volume index Unit:ml	443	NR	6 months	443	NR	Mean change from baseline -14.8	NR
Zareba,2011 ²⁴ MADIT CRT Sub Study	ICD Non LBBB	Left ventricular end diastolic volume/ volume index Unit:ml	179	NR	6 months	179	NR	Mean change from baseline -14.4	NR
Zareba,2011 ²⁴ MADIT CRT Sub Study	CRT D LBBB	Left ventricular end diastolic volume/ volume index Unit:ml	532	NR	6 months	532	NR	Mean change from baseline -56.7	NR
Zareba,2011 ²⁴ MADIT CRT Sub Study	CRTD Non LBBB	Left ventricular end diastolic volume/ volume index Unit:ml	216	NR	6 months	216	NR	Mean change from baseline -41	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Zareba,2011 ²⁴ MADIT CRT Sub Study	ICD LBBB	Left ventricular end diastolic volume/ volume index Unit:ml	443	NR	6 months	443	NR	% change from baseline -5.9	NR
Zareba,2011 ²⁴ MADIT CRT Sub Study	ICD Non LBBB	Left ventricular end diastolic volume/ volume index Unit:ml	179	NR	6 months	179	NR	% change from baseline -5.9	NR
Zareba,2011 ²⁴ MADIT CRT Sub Study	CRT D LBBB	Left ventricular end diastolic volume/ volume index Unit:ml	532	NR	6 months	532	NR	% change from baseline -22.5	NR
Zareba,2011 ²⁴ MADIT CRT Sub Study	CRTD Non LBBB	Left ventricular end diastolic volume/ volume index Unit:ml	216	NR	6 months	216	NR	% change from baseline -16.4	NR
Barsheshet,20 11 ¹¹	CRTD Ischemic Cardiomyopathy	Left ventricular end diastolic volume/ volume index Unit:ml	154	NR	6 months	154	NR	% change from baseline -18	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author, Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Barsheshet,2011 ¹¹	CRTD Non Ischemic Cardiomyopathy	Left ventricular end diastolic volume/ volume index Unit:ml	477	NR	6 months	477	NR	% change from baseline -24	NR
Barsheshet,2011 ¹¹	ICD Ischemic Cardiomyopathy	Left ventricular end diastolic volume/ volume index Unit:ml	194	NR	6 months	194	NR	% change from baseline -5	NR
Barsheshet,2011 ¹¹	ICD Non Ischemic Cardiomyopathy	Left ventricular end diastolic volume/ volume index Unit:ml	592	NR	6 months	592	NR	% change from baseline -7	NR
Left ventricular ejection fraction									
Abraham,2004 ⁴¹ MIRACLE ICD II	Control	Left ventricular ejection fraction Unit:%	101	Mean: 24.6 SD: 6.7	6 months	85	NR	0.8	NR
Abraham,2004 ⁴¹ MIRACLE ICD II	CRT	Left ventricular ejection fraction Unit:%	85	Mean: 24.4 SD: 6.6	6 months	68	NR	3.8	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Higgins,2003 ⁶⁵ VENTAK CHF/CONTAK CD	CRT	Left ventricular ejection fraction Unit: %	245	Mean: 21 SD: 7	6 months	222	NR	5.1	NR
Higgins,2003 ⁶⁵ VENTAK CHF/CONTAK CD	No CRT	Left ventricular ejection fraction Unit: %	245	Mean: 22 SD: 7	6 months	216	NR	2.8	NR
Moss,2009 ⁹	ICD	Left ventricular ejection fraction Unit: %	731	Mean: 24 SD: 5	1 year	620	NR	Mean change from baseline 3	NR
Moss,2009 ⁹	CRT-D	Left ventricular ejection fraction Unit: %	1098	Mean: 24 SD: 5	1 year	746	NR	Mean change from baseline 11	NR
Young,2003 ³¹ MIRACLE ICD	Control	Left ventricular ejection fraction Unit: %	182	Mean: 23.9 SD: 6	6 months	133	NR	1.7	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Young,2003 ³¹ MIRACLE ICD	CRT	Left ventricular ejection fraction Unit: %	187	Mean: 24.2 SD: 6.5	6 months	132	NR	2.1	NR
Solomom,2010 ²¹ MADIT CRT Sub Study	ICD	Left ventricular ejection fraction Unit: %	623	Mean: 0.29 SD: 0.03	12 months	623	Mean: 0.32 SD: 0.04	0.03	NR
Solomom,2010 ²¹ MADIT CRT Sub Study	CRT-D	Left ventricular ejection fraction Unit: %	749	Mean: 0.29 SD: 0.03	12 months	749	Mean: 0.41 SD: 0.06	0.11	NR
Diab, 2011 ⁵⁴	Arm 3	Left ventricular ejection fraction Unit: %	24	Mean: 25 SD: 5	6 months	21	Mean: 29 SD: 9	NR	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Diab, 2011 ⁵⁴	Arm 4	Left ventricular ejection fraction Unit: %	22	Mean: 26 SD: 6	6 months	UNCLEAR (19?)	Mean: 27 SD: 8	NR	NR
Diab, 2011 ⁵⁴	Arm 1	Left ventricular ejection fraction Unit: %	27	Mean: 210 SD: 89	6 months	27	Mean: 198 SD: 72	NR	NR
Pinter,2009 ⁸⁸	CRT ON	Left ventricular ejection fraction Unit: %	36	Mean: 24.2 SD: 7.5	6 months	36	NR	1.7	NR
Pinter,2009 ⁸⁸	CRT OFF	Left ventricular ejection fraction Unit: %	36	Mean: 26.8 SD: 8.4	6 months	36	NR	0.6	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Pinter,2009 ⁸⁸	CRT ON	Left ventricular ejection fraction Unit: %	36	Mean: 21.2 SD: 7.9	6 months	36	NR	3.9	NR
Pinter,2009 ⁸⁸	CRT OFF	Left ventricular ejection fraction Unit: %	36	Mean: 24 SD: 8.3	6 months	36	NR	1.9	NR
Arshad,2011 ¹⁰	ICD,Women	Left ventricular ejection fraction Unit: %	154	NR	6 months	154	NR	Median change from baseline 0.03	NR
Arshad,2011 ¹⁰	ICD, Men	Left ventricular ejection fraction Unit: %	469	NR	6 months	469	NR	Median change from baseline 0.03	NR
Arshad,2011 ¹⁰	CRT D Women	Left ventricular ejection fraction Unit: %	184	NR	6 months	184	NR	Median change from baseline 0.13	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Arshad,2011 ¹⁰	CRT D Men	Left ventricular ejection fraction Unit: %	565	NR	6 months	565	NR	Median change from baseline 0.1	NR
Arshad,2011 ¹⁰	ICD,Women, Ischemic heart disease	Left ventricular ejection fraction Unit: %	40	NR	6 months	40	NR	Median change from baseline 0.04	NR
Arshad,2011 ¹⁰	ICD,men, Ischemic heart disease	Left ventricular ejection fraction Unit: %	294	NR	6 months	294	NR	Median change from baseline 0.03	NR
Arshad,2011 ¹⁰	CRT D,Women, Ischemic heart disease	Left ventricular ejection fraction Unit: %	52	NR	6 months	52	NR	Median change from baseline 0.13	NR
Arshad,2011 ¹⁰	CRT D,men, Ischemic heart disease	Left ventricular ejection fraction Unit: %	359	NR	6 months	359	NR	Median change from baseline 0.1	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Arshad,2011 ¹⁰	ICD,Women, Non Ischemic heart disease	Left ventricular ejection fraction Unit: %	114	NR	6 months	114	NR	Median change from baseline 0.03	NR
Arshad,2011 ¹⁰	ICD,men, Non Ischemic heart disease	Left ventricular ejection fraction Unit: %	175	NR	6 months	175	NR	Median change from baseline 0.03	NR
Arshad,2011 ¹⁰	CRT D,Women, Non Ischemic heart disease	Left ventricular ejection fraction Unit: %	132	NR	6 months	132	NR	Median change from baseline 0.13	NR
Arshad,2011 ¹⁰	CRT D,men, Non Ischemic heart disease	Left ventricular ejection fraction Unit: %	206	NR	6 months	206	NR	Median change from baseline 0.12	NR
Arshad,2011 ¹⁰	ICD,Women, QRS <150ms	Left ventricular ejection fraction Unit: %	45	NR	6 months	45	NR	Median change from baseline 0.04	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Arshad,2011 ¹⁰	ICD, Men,QRS <150ms	Left ventricular ejection fraction Unit: %	166	NR	6 months	166	NR	Median change from baseline 0.03	NR
Arshad,2011 ¹⁰	CRT D Women,QRS <150ms	Left ventricular ejection fraction Unit: %	58	NR	6 months	58	NR	Median change from baseline 0.12	NR
Arshad,2011 ¹⁰	CRT D Men,QRS <150ms	Left ventricular ejection fraction Unit: %	200	NR	6 months	200	NR	Median change from baseline 0.1	NR
Arshad,2011 ¹⁰	ICD,Women, QRS >=150ms	Left ventricular ejection fraction Unit: %	109	NR	6 months	109	NR	Median change from baseline 0.03	NR
Arshad,2011 ¹⁰	ICD, Men,QRS >=150ms	Left ventricular ejection fraction Unit: %	303	NR	6 months	303	NR	Median change from baseline 0.03	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Arshad,2011 ¹⁰	CRT D Women,QRS >/=150ms	Left ventricular ejection fraction Unit: %	126	NR	6 months	126	NR	Median change from baseline 0.13	NR
Arshad,2011 ¹⁰	CRT D Men,QRS >/=150ms	Left ventricular ejection fraction Unit: %	365	NR	6 months	365	NR	Median change from baseline 0.11	NR
Arshad,2011 ¹⁰	ICD,Women,Non LBBB	Left ventricular ejection fraction Unit: %	20	NR	6 months	20	NR	Median change from baseline 0.03	NR
Arshad,2011 ¹⁰	ICD, Men,Non LBBB	Left ventricular ejection fraction Unit: %	159	NR	6 months	159	NR	Median change from baseline 0.03	NR
Arshad,2011 ¹⁰	CRT D Women,Non LBBB	Left ventricular ejection fraction Unit: %	25	NR	6 months	25	NR	Median change from baseline 0.1	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Arshad,2011 ¹⁰	CRT D Men,Non LBBB	Left ventricular ejection fraction Unit: %	192	NR	6 months	192	NR	Median change from baseline 0.09	NR
Arshad,2011 ¹⁰	ICD,Women,LBBB	Left ventricular ejection fraction Unit: %	134	NR	6 months	134	NR	Median change from baseline 0.03	NR
Arshad,2011 ¹⁰	ICD, Men,LBBB	Left ventricular ejection fraction Unit: %	309	NR	6 months	309	NR	Median change from baseline 0.03	NR
Arshad,2011 ¹⁰	CRT D Women,LBBB	Left ventricular ejection fraction Unit: %	159	NR	6 months	159	NR	Median change from baseline 0.13	NR
Arshad,2011 ¹⁰	CRT D Men,LBBB	Left ventricular ejection fraction Unit: %	373	NR	6 months	373	NR	Median change from baseline 0.11	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author, Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Zareba, 2011 ²⁴ MADIT CRT Sub Study	ICD LBBB	Left ventricular ejection fraction Unit: %	443	NR	6 months	443	NR	Mean change from baseline 3.4	NR
Zareba, 2011 ²⁴ MADIT CRT Sub Study	ICD Non LBBB	Left ventricular ejection fraction Unit: %	179	NR	6 months	179	NR	Mean change from baseline 3.4	NR
Zareba, 2011 ²⁴ MADIT CRT Sub Study	CRT D LBBB	Left ventricular ejection fraction Unit: %	532	NR	6 months	532	NR	Mean change from baseline 11.9	NR
Zareba, 2011 ²⁴ MADIT CRT Sub Study	CRTD Non LBBB	Left ventricular ejection fraction Unit: %	216	NR	6 months	216	NR	Mean change from baseline 8.8	NR

Table D14: Outcomes reported in the trials assessing effectiveness of CRT-D (continued)

Author, Year Trial	Arm	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Barsheshet,2011 ¹¹	CRTD Ischemic Cardiomyopathy	Left ventricular ejection fraction Unit: %	154	NR	6 months	154	NR	% change from baseline 10	NR
Barsheshet,2011 ¹¹	CRTD Non Ischemic Cardiomyopathy	Left ventricular ejection fraction Unit: %	477	NR	6 months	477	NR	% change from baseline 12	NR
Barsheshet,2011 ¹¹	ICD Ischemic Cardiomyopathy	Left ventricular ejection fraction Unit: %	194	NR	6 months	194	NR	% change from baseline 3	NR
Barsheshet,2011 ¹¹	ICD Non Ischemic Cardiomyopathy	Left ventricular ejection fraction Unit: %	592	NR	6 months	592	NR	% change from baseline 3	NR

CRT-P=Cardiac Resynchronization Therapy Paced, CRT-D=Cardiac Resynchronization Therapy with Defibrillator, ICD=Implantable Cardioverter Defibrillator, N=Number, HR=Hazard Ratio, CI=Confidence Interval, OR=Odds Ratio, RD=Risk Difference, P=P value, NA=Not Applicable, LBBB=Left Bundle Branch Block, LVEF=Left Ventricular Ejection Fraction, CABG=Coronary Artery Bypass Graft, CRT=Cardiac Resynchronization Therapy, Biv=Bi-Ventricular, RV=Right Ventricular, IHD=Ischemic Heart Disease, NR=Not Reported, SD=Standard Deviation, NA=Not Applicable

Table D15: Outcomes reported in the trials assessing effectiveness of CRT-D (Hospitalization for heart failure and All-cause mortality)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
All-cause mortality								
Tang,2010 ²⁵ RAFT	ICD	All-cause mortality	904	NR	236(26.1)	NR	NR	HR: 0.75 95% CI: 0.62-0.91
Tang,2010 ²⁵ RAFT	ICD-CRT	All-cause mortality	894	NR	186(20.8)	NR	NR	NA
Higgins,2003 ⁶⁵ VENTAK CHF/CONTAK CD	CRT	All-cause mortality	245	6 months	11(4.5)	NR	NR	NR
Higgins,2003 ⁶⁵ VENTAK CHF/CONTAK CD	No CRT	All-cause mortality	245	6 months	16(6.5)	NR	NR	NR
Moss,2009 ⁹	ICD	All-cause mortality	731	NR	53(7.3)	NR	NR	HR: 1 95% CI: 0.69- 1.44
Moss,2009 ⁹	CRT-D	All-cause mortality	1089	NR	74(6.8)	NR	NR	NA
Healey,2012 ²⁹ RAFT Sub Study	ICD	All-cause mortality	115	12 months	NR(30.4)	NR	NR	HR: 1.04 95% CI: 0.66- 1.62
Healey,2012 ²⁹ RAFT Sub Study	CRT-ICD	All-cause mortality	114	12 months	NR(36.8)	NR	NR	NA

**Table D15: Outcomes reported in the trials assessing effectiveness of CRT-D (Hospitalization for heart failure and All-cause mortality)
(continued)**

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Solomom,2010 ²¹ MADIT CRT Sub Study	ICD	All-cause mortality	623	12 months	98(16.8)	NR	NR	NR
Solomom,2010 ²¹ MADIT CRT Sub Study	CRT-D	All-cause mortality	749	12 months	55(7.8)	NR	NR	NR
Tompkins, 2013 ²³	ICD	All-cause mortality	81	12 months	see Figure 3b(2)	see Figure 3b(2)	NR	NR
Tompkins, 2013 ²³	CRT-D LAFB	All-cause mortality	75	12 months	see Figure 3b(4)	see Figure 3b(4)	NR	NR
Tompkins, 2013 ²³	CRT-D non- LAFB	All-cause mortality	49	12 months	see Figure 3b(2)	see Figure 3b(2)	NR	NR
Tompkins, 2013 ²³	ICD	All-cause mortality	68	24 months	see Figure 3b(6)	see Figure 3b(6)	NR	NR
Tompkins, 2013 ²³	CRT-D LAFB	All-cause mortality	66	24 months	see Figure 3b(8)	see Figure 3b(8)	NR	NR
Tompkins, 2013 ²³	CRT-D non- LAFB	All-cause mortality	43	24 months	see Figure 3b(2)	see Figure 3b(2)	NR	NR
Diab, 2011 ⁵⁴	Arm 1	All-cause mortality		6 months	0(0)		NR	NR
Diab, 2011 ⁵⁴	Arm 2	All-cause mortality		6 months	0(0)		NR	NR
Diab, 2011 ⁵⁴	Arm 3	All-cause mortality		6 months	1(NR)		NR	NR
Birnie,2013 ³⁶ RAFT Sub Study	ICD-CRT (LBBB)	All-cause mortality	594	NR	105(17.7)	NR	NR	HR: 0.664 95% CI: 0.516- 0.853

**Table D15: Outcomes reported in the trials assessing effectiveness of CRT-D (Hospitalization for heart failure and All-cause mortality)
(continued)**

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Birnie,2013 ²⁶ RAFT Sub Study	ICD-CRT (Non-LBBB)	All-cause mortality	143	NR	29(20.3)	NR	NR	HR: 0.705 95% CI: 0.444-1.121
Birnie,2013 ²⁶ RAFT Sub Study	ICD-CRT (RBBB)	All-cause mortality	60	NR	10(16.7)	NR	NR	HR: 0.544 95% CI: 0.264-1.121
Birnie,2013 ²⁶ RAFT Sub Study	ICD-CRT (NIVCD)	All-cause mortality	83	NR	19(22.9)	NR	NR	HR: 0.93 95% CI: 0.491-1.761
Birnie,2013 ²⁶ RAFT Sub Study	ICD(LBBB)	All-cause mortality	581	NR	145(25)	NR	NR	NR
Birnie,2013 ²⁶ RAFT Sub Study	ICD(Non-LBBB)	All-cause mortality	165	NR	47(28.5)	NR	NR	NR
Birnie,2013 ²⁶ RAFT Sub Study	ICD(RBBB)	All-cause mortality	81	NR	28(34.6)	NR	NR	NR
Birnie,2013 ²⁶ RAFT Sub Study	ICD(NIVCD)	All-cause mortality	84	NR	19(22.6)	NR	NR	NR
Barsheshet,2011 ¹¹	All Ischemia	All-cause mortality	1046	6 months	NR	NR	NR	HR: 0.99 95% CI: 0.65-1.52

**Table D15: Outcomes reported in the trials assessing effectiveness of CRT-D (Hospitalization for heart failure and All-cause mortality)
(continued)**

Author, Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Barsheshet,2011 ¹¹	Ischemia NYHA II	All-cause mortality	781	6 months	NR	NR	NR	HR: 0.96 95% CI: 0.59-1.55
Barsheshet,2011 ¹¹	Non Ischemia	All-cause mortality	774	6 months	NR	NR	NR	HR: 0.87 95% CI: 0.45-1.67
Arshad,2011 ¹⁰ MADIT CRT Sub Study	Women	All-cause mortality	453	6 months	20(NR)	NR	NR	HR: 0.28 95% CI: 0.1-0.79
Arshad,2011 ¹⁰ MADIT CRT Sub Study	Men	All-cause mortality	1365	6 months	107(NR)	NR	NR	HR: 1.05 95% CI: 0.7-1.57
Arshad,2011 ¹⁰ MADIT CRT Sub Study	Women, Ischemic heart disease	All-cause mortality	125	6 months	5(NR)	NR	NR	HR: 0.17 95% CI: 0.02-1.66
Arshad,2011 ¹⁰ MADIT CRT Sub Study	men, Ischemic heart disease	All-cause mortality	874	6 months	83(NR)	NR	NR	HR: 0.99 95% CI: 0.62-1.57
Arshad,2011 ¹⁰ MADIT CRT Sub Study	Women, Non Ischemic heart disease	All-cause mortality	328	6 months	15(NR)	NR	NR	HR: 0.33 95% CI: 0.1-1.1
Arshad,2011 ¹⁰ MADIT CRT Sub Study	men, Non Ischemic heart disease	All-cause mortality	493	6 months	24(NR)	NR	NR	HR: 1.34 95% CI: 0.55-3.31

**Table D15: Outcomes reported in the trials assessing effectiveness of CRT-D (Hospitalization for heart failure and All-cause mortality)
(continued)**

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Arshad,2011 ¹⁰ MADIT CRT Sub Study	Women, QRS <150ms	All-cause mortality	148	6 months	8(NR)	NR	NR	HR: 0.4 95% CI: 0.09- 1.8
Arshad,2011 ¹⁰ MADIT CRT Sub Study	Men, QRS <150ms	All-cause mortality	497	6 months	42(NR)	NR	NR	HR: 1.2 95% CI: 0.62- 2.34
Arshad,2011 ¹⁰ MADIT CRT Sub Study	Women, QRS >=150ms	All-cause mortality	305	6 months	12(NR)	NR	NR	HR: 0.18 95% CI: 0.04- 0.89
Arshad,2011 ¹⁰ MADIT CRT Sub Study	Men, QRS >=150ms	All-cause mortality	870	6 months	65(NR)	NR	NR	HR: 1.03 95% CI: 0.61- 1.75
Arshad,2011 ¹⁰ MADIT CRT Sub Study	Women, Non LBBB	All-cause mortality	59	6 months	0(NR)	NR	NR	NR
Arshad,2011 ¹⁰ MADIT CRT Sub Study	Men, Non LBBB	All-cause mortality	478	6 months	0(NR)	NR	NR	NR
Arshad,2011 ¹⁰ MADIT CRT Sub Study	Women, LBBB	All-cause mortality	394	6 months	17(NR)	NR	NR	HR: 0.22 95% CI: 0.07- 0.7
Arshad,2011 ¹⁰ MADIT CRT Sub Study	Men, LBBB	All-cause mortality	887	6 months	68(NR)	NR	NR	HR: 0.84 95% CI: 0.67- 1.61

**Table D15: Outcomes reported in the trials assessing effectiveness of CRT-D (Hospitalization for heart failure and All-cause mortality)
(continued)**

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Zareba,2011 ²⁴ MADIT CRT Sub Study	LBBB	All-cause mortality	1281	6 months	NR	NR	NR	HR: 0.75 95% CI: 0.49- 1.16
Zareba,2011 ²⁴ MADIT CRT Sub Study	Non LBBB	All-cause mortality	536	6 months	NR	NR	NR	HR: 1.79 95% CI: 0.9- 3.57
Zareba,2011 ²⁴ MADIT CRT Sub Study	RBBB	All-cause mortality	228	6 months	NR	NR	NR	HR: 1.53 95% CI: 0.54- 4.37
Zareba,2011 ²⁴ MADIT CRT Sub Study	IVCD	All-cause mortality	308	6 months	NR	NR	NR	HR: 2 95% CI: 0.8-5.02
Abraham,2004 ⁴¹ MIRACLE ICD II	Control	All-cause mortality	101	6 months	2(NR)	NR	NR	NR
Abraham,2004 ⁴¹ MIRACLE ICD II	CRT	All-cause mortality	85	6 months	2(NR)	NR	NR	NR
Young,2003 ³¹ MIRACLE ICD	Control	All-cause mortality	182	6 months	15(NR)	NR	NR	NR
Young,2003 ³¹ MIRACLE ICD	CRT	All-cause mortality	187	6 months	14(NR)	NR	NR	NR

**Table D15: Outcomes reported in the trials assessing effectiveness of CRT-D (Hospitalization for heart failure and All-cause mortality)
(continued)**

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Lozano,2000 ⁸²	BV Pacing	All-cause mortality	109	3 months	5(4.6)	NR	NR	NR
Lozano,2000 ⁸²	No Pacing	All-cause mortality	113	3 months	10(8.8)	NR	NR	NR
Goldenberg, 2014 ¹⁵	CRTD(LBBB)	All-cause mortality	NR	NR	NR	NR	NR	HR: 0.59 95% CI: 0.43- 0.80 P<0.001
Goldenberg, 2014 ¹⁵	ICD(LBBB)	All-cause mortality	NR	NR	NR	NR	NR	NA
Goldenberg, 2014 ¹⁵	CRTD(Non- LBBB)	All-cause mortality	NR	NR	NR	NR	NR	HR: 1.57 95% CI: 1.03- 2.39 P: 0.04
Goldenberg, 2014 ¹⁵	ICD(Non-LBBB)	All-cause mortality	NR	NR	NR	NR	NR	NA
Stockburger, 2016 ²² MADIT study	ICD, long PR (≥230ms)	All-cause mortality	36	Median: 5.8 years	NR	NR	NR	Reference
Stockburger, 2016 ²² MADIT study	ICD, normal PR (<230ms)	All-cause mortality	171	Median: 5.8 years	NR	NR	NR	Reference
Stockburger, 2016 ²² MADIT study	CRT-D, long PR (≥230ms)	All-cause mortality	60	Median: 5.8 years	NR	NR	NR	HR: 2.27 95% CI: 1.16 to 4.44, p=0.014
Stockburger, 2016 ²² MADIT study	CRT-D, normal PR (<230ms)	All-cause mortality	267	Median: 5.8 years	NR	NR	NR	HR: 0.24 95% CI: 0.07 to 0.80, p=0.02

**Table D15: Outcomes reported in the trials assessing effectiveness of CRT-D (Hospitalization for heart failure and All-cause mortality)
(continued)**

Author, Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Biton, 2016 ¹³ MADIT study	CRT-D (aggregated arms)	All-cause mortality	328	7 years	NR	NR	NR	HR: 1.01 95% CI: 0.98 to 1.04, p=0.716
Biton, 2016 ¹³ MADIT study	ICD (QRS <150msec)	All-cause mortality	139	7 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT study	CRT-D (QRS <150msec)	All-cause mortality	204	7 years	NR	NR	NR	HR: 1.26 95% CI: 0.76 to 2.08, p=0.37
Biton, 2016 ¹³ MADIT study	ICD (QRS ≥150msec)	All-cause mortality	70	7 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT study	CRT-D (QRS ≥150msec)	All-cause mortality	124	7 years	NR	NR	NR	HR: 1.39 95% CI: 0.67 to 2.88, p=0.378
Biton, 2016 ¹³ MADIT study	ICD (Quartile1 QRS ≤134msec)	All-cause mortality	49	5 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT study	CRT-D (Quartile1 QRS ≤134msec)	All-cause mortality	81	5 years	NR	NR	NR	HR: 2.32 95% CI: 0.97 to 5.57, p=0.059
Biton, 2016 ¹³ MADIT study	ICD (Quartile2-4 QRS >134msec)	All-cause mortality	160	5 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT study	CRT-D (Quartile2-4 QRS >134msec)	All-cause mortality	247	5 years	NR	NR	NR	HR: 1.06 95% CI: 0.66 to 1.69, p=0.812
Biton, 2016 ¹³ MADIT study	ICD and RBBB	All-cause mortality	92	5 years	NR	NR	NR	Reference

Table D15: Outcomes reported in the trials assessing effectiveness of CRT-D (Hospitalization for heart failure and All-cause mortality)
(continued)

Author, Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Biton, 2016 ¹³ MADIT study	CRT-D and RBBB	All-cause mortality	136	5 years	NR	NR	NR	HR: 1.38 95% CI: 0.70 to 2.72, p=0.352
Biton, 2016 ¹³ MADIT study	ICD and IVCD	All-cause mortality	NR	5 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT study	CRT-D and IVCD	All-cause mortality	NR	5 years	NR	NR	NR	HR: 0.26 95% CI: 0.75 to 2.13, p=0.38
Biton, 2015 ¹² MADIT study	ICD, men	All-cause mortality	365	7 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT study	CRT-D, men	All-cause mortality	522	7 years	NR	NR	NR	HR: 0.7 95% CI: 0.50 to 0.97, p=0.038
Biton, 2015 ¹² MADIT study	ICD, women	All-cause mortality	155	7 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT study	CRT-D, women	All-cause mortality	239	7 years	NR	NR	NR	HR: 0.49 95% CI: 0.25 to 0.96, p=0.365
Biton, 2015 ¹² MADIT study	ICD, men (QRS <150ms)	All-cause mortality	NR	7 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT study	CRT-D, men (QRS <150ms)	All-cause mortality	NR	7 years	NR	NR	NR	HR: 0.42 95% CI: 0.21 to 0.83, p=0.564
Biton, 2015 ¹² MADIT study	ICD, men (QRS ≥150ms)	All-cause mortality	NR	7 years	NR	NR	NR	Reference

**Table D15: Outcomes reported in the trials assessing effectiveness of CRT-D (Hospitalization for heart failure and All-cause mortality)
(continued)**

Author, Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Biton, 2016 ¹³ MADIT study	CRT-D, men (QRS ≥150ms)	All-cause mortality	NR	7 years	NR	NR	NR	HR: 0.77 95% CI: 0.52 to 1.13, p=0.224
Biton, 2015 ¹² MADIT study	ICD, women (QRS <150ms)	All-cause mortality	NR	7 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT study	CRT-D, women (QRS <150ms)	All-cause mortality	NR	7 years	NR	NR	NR	HR: 0.65 95% CI: 0.17 to 2.45, p=0.525
Biton, 2015 ¹² MADIT study	ICD, women (QRS ≥150ms)	All-cause mortality	NR	7 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT study	CRT-D, women (QRS ≥150ms)	All-cause mortality	NR	7 years	NR	NR	NR	HR: 0.45 95% CI: 0.21 to 0.98, p=0.044
Hospitalization for heart failure								
Tang, 2010 ²⁵ RAFT	ICD	Hospitalization for heart failure	904	NR	236(26.1)	NR	NR	HR: 0.68 95% CI: 0.56- 0.83
Tang, 2010 ²⁵ RAFT	ICD-CRT	Hospitalization for heart failure	894	NR	174(19.5)	NR	NR	NA
Healey-2012 ²⁹	ICD	Hospitalization for heart failure	115	12 months	NR(27.8)	NR	NR	HR: 0.58 95% CI: 0.38- 1.01
Healey-2012 ²⁹	CRT-ICD	Hospitalization for heart failure	114	12 months	NR(19.3)	NR	NR	NA

**Table D15: Outcomes reported in the trials assessing effectiveness of CRT-D (Hospitalization for heart failure and All-cause mortality)
(continued)**

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Diab, 2011 ⁵⁴	Arm 1	Hospitalization for heart failure	27	6 months	27(100)	2(7.4)	NR	NR
Diab, 2011 ⁵⁴	Arm 2a	Hospitalization for heart failure	21	6 months	21(100)	1(4.8)	NR	NR
Diab, 2011 ⁵⁴	Arm 2b	Hospitalization for heart failure	19 (unclear)	6 months	19 (unclear)	2(10.5)	NR	NR
Birnie,2013 ²⁶ RAFT Sub Study	ICD-CRT (LBBB)	Hospitalization for heart failure	594	NR	104(17.5)	NR	NR	HR: 0.603 95% CI: 0.469- 0.774
Birnie,2013 ²⁶ RAFT Sub Study	ICD-CRT (Non- LBBB)	Hospitalization for heart failure	143	NR	39(27.3)	NR	NR	HR: 1.085 95% CI: 0.702- 1.680
Birnie,2013 ²⁶ RAFT Sub Study	ICD-CRT (RBBB)	Hospitalization for heart failure	60	NR	15(25)	NR	NR	HR: 1.142 95% CI: 0.580- 2.249
Birnie,2013 ²⁶ RAFT Sub Study	ICD-CRT (NIVCD)	Hospitalization for heart failure	83	NR	24(28.9)	NR	NR	HR: 1.021 95% CI: 0.574- 1.815

**Table D15: Outcomes reported in the trials assessing effectiveness of CRT-D (Hospitalization for heart failure and All-cause mortality)
(continued)**

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Birnie,2013 ²⁶ RAFT Sub Study	ICD(LBBB)	Hospitalization for heart failure	581	NR	151(26)	NR	NR	NR
Birnie,2013 ²⁶ RAFT Sub Study	ICD(Non-LBBB)	Hospitalization for heart failure	165	NR	42(25.5)	NR	NR	NR
Birnie,2013 ²⁶ RAFT Sub Study	ICD(RBBB)	Hospitalization for heart failure	81	NR	19(23.5)	NR	NR	NR
Birnie,2013 ²⁶ RAFT Sub Study	ICD(NIVCD)	Hospitalization for heart failure	84	NR	23(27.4)	NR	NR	NR
Moss,2009 ⁹	ICD	Hospitalization for heart failure	731	NR	167(22.8)	NR	NR	HR: 0.59 95% CI: 0.47- 0.74
Moss,2009 ⁹	CRT-D	Hospitalization for heart failure	1089	NR	151(13.9)	NR	NR	NA
Arshad,2011 ¹⁰	Women	Hospitalization for heart failure	453	6 months	73(NR)	NR	NR	HR: 0.3 95% CI: 0.18-0.5
Arshad,2011 ¹⁰	Men	Hospitalization for heart failure	1365	6 months	249(NR)	NR	NR	HR: 0.65 95% CI: 0.5- 0.84
Arshad,2011 ¹⁰	Women, Ischemic heart disease	Hospitalization for heart failure	125	6 months	23(NR)	NR	NR	HR: 0.31 95% CI: 0.12- 0.76

**Table D15: Outcomes reported in the trials assessing effectiveness of CRT-D (Hospitalization for heart failure and All-cause mortality)
(continued)**

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Arshad,2011 ¹⁰	Men, Ischemic heart disease	Hospitalization for heart failure	874	6 months	180(NR)	NR	NR	HR: 0.58 95% CI: 0.43-0.79
Arshad,2011 ¹⁰	Women, Non Ischemic heart disease	Hospitalization for heart failure	328	6 months	50(NR)	NR	NR	HR: 0.31 95% CI: 0.17-0.56
Arshad,2011 ¹⁰	men, Non Ischemic heart disease	Hospitalization for heart failure	493	6 months	69(NR)	NR	NR	HR: 0.88 95% CI: 0.54-1.45
Arshad,2011 ¹⁰	Women, QRS <150ms	Hospitalization for heart failure	148	6 months	23(NR)	NR	NR	HR: 0.26 95% CI: 0.1-0.65
Arshad,2011 ¹⁰	Men, QRS <150ms	Hospitalization for heart failure	497	6 months	107(NR)	NR	NR	HR: 1.08 95% CI: 0.71-1.6
Arshad,2011 ¹⁰	Women, QRS >=150ms	Hospitalization for heart failure	305	6 months	50(NR)	NR	NR	HR: 0.31 95% CI: 0.17-0.58
Arshad,2011 ¹⁰	Men, QRS >=150ms	Hospitalization for heart failure	870	6 months	142(NR)	NR	NR	HR: 0.45 95% CI: 0.32-0.64
Arshad,2011 ¹⁰	Women, Non LBBB	Hospitalization for heart failure	59	6 months	10(NR)	NR	NR	HR: 1.95 95% CI: 0.4-9.53
Arshad,2011 ¹⁰	Men, Non LBBB	Hospitalization for heart failure	478	6 months	96(NR)	NR	NR	HR: 1.04 95% CI: 0.67-1.61
Arshad,2011 ¹⁰	Women, LBBB	Hospitalization for heart failure	394	6 months	63(NR)	NR	NR	HR: 0.22 95% CI: 0.12-0.4

**Table D15: Outcomes reported in the trials assessing effectiveness of CRT-D (Hospitalization for heart failure and All-cause mortality)
(continued)**

Author, Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Arshad,2011 ¹⁰	Men,LBBB	Hospitalization for heart failure	887	6 months	153(NR)	NR	NR	HR: 0.47 95% CI: 0.34- 0.66
Barsheshet,2011 ¹¹	All Ischemia	Hospitalization for heart failure	1046	6 months	NR	NR	NR	HR: 0.58 95% CI: 0.45- 0.77
Barsheshet,2011 ¹¹	Ischemia NYHA II	Hospitalization for heart failure	781	6 months	NR	NR	NR	HR: 0.57 95% CI: 0.41- 0.77
Barsheshet,2011 ¹¹	Non Ischemia	Hospitalization for heart failure	774	6 months	NR	NR	NR	HR: 0.5 95% CI: 0.35-0.75
Biton, 2016 ¹³ MADIT CRT Sub Study	ICD (aggregated arms)	Hospitalization for heart failure	199	7 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT CRT Sub Study	CRT-D (aggregated arms)	Hospitalization for heart failure	328	7 years	NR	NR	NR	HR: 1 95% CI: 0.97 to 1.02, p=0.765
Biton, 2016 ¹³ MADIT CRT Sub Study	ICD (QRS <150msec)	Hospitalization for heart failure	139	7 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT CRT Sub Study	CRT-D (QRS <150msec)	Hospitalization for heart failure	204	7 years	NR	NR	NR	HR: 1.21 95% CI: 0.79 to 1.87, p=0.385

**Table D15: Outcomes reported in the trials assessing effectiveness of CRT-D (Hospitalization for heart failure and All-cause mortality)
(continued)**

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Biton, 2016 ¹³ MADIT CRT Sub Study	ICD (QRS ≥150msec)	Hospitalization for heart failure	70	7 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT CRT Sub Study	CRT-D (QRS ≥150msec)	Hospitalization for heart failure	124	7 years	NR	NR	NR	HR: 0.88 95% CI: 0.50 to 1.52, p=0.637
Biton, 2016 ¹³ MADIT CRT Sub Study	ICD (Quartile1 QRS ≤134msec)	Hospitalization for heart failure	49	5 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT CRT Sub Study	CRT-D (Quartile1 QRS ≤134msec)	Hospitalization for heart failure	81	5 years	NR	NR	NR	HR: 2.04 95% CI: 0.93 to 4.44, p=0.074
Biton, 2016 ¹³ MADIT CRT Sub Study	ICD (Quartile2-4 QRS >134msec)	Hospitalization for heart failure	160	5 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT CRT Sub Study	CRT-D (Quartile2-4 QRS >134msec)	Hospitalization for heart failure	247	5 years	NR	NR	NR	HR: 0.9 95% CI: 0.62 to 1.32, p=0.592
Biton, 2016 ¹³ MADIT CRT Sub Study	ICD and RBBB	Hospitalization for heart failure	92	5 years	NR	NR	NR	Reference

**Table D15: Outcomes reported in the trials assessing effectiveness of CRT-D (Hospitalization for heart failure and All-cause mortality)
(continued)**

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Biton, 2016 ¹³ MADIT CRT Sub Study	CRT-D and RBBB	Hospitalization for heart failure	136	5 years	NR	NR	NR	HR: 0.86 95% CI: 0.48 to 1.55, p=0.618
Biton, 2016 ¹³ MADIT CRT Sub Study	ICD and IVCD	Hospitalization for heart failure	NR	5 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT CRT Sub Study	CRT-D and IVCD	Hospitalization for heart failure	NR	5 years	NR	NR	NR	HR: 0.22 95% CI: 0.80 tp 1.86, p=0.356
Biton, 2015 ¹² MADIT CRT Sub Study	ICD, men (QRS ≥150ms)	Hospitalization for heart failure	NR	7 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT CRT Sub Study	CRT-D, men (QRS ≥150ms)	Hospitalization for heart failure	NR	7 years	NR	NR	NR	HR: 0.41 95% CI: 0.29 to 0.58, p=0.107
Biton, 2015 ¹² MADIT CRT Sub Study	ICD, women (QRS <150ms)	Hospitalization for heart failure	NR	7 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT CRT Sub Study	CRT-D, women (QRS <150ms)	Hospitalization for heart failure	NR	7 years	NR	NR	NR	HR: 0.22 95% CI: 0.08 to 0.58, p=0.002

**Table D15: Outcomes reported in the trials assessing effectiveness of CRT-D (Hospitalization for heart failure and All-cause mortality)
(continued)**

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Biton, 2015 ¹² MADIT CRT Sub Study	ICD, women (QRS ≥150ms)	Hospitalization for heart failure	NR	7 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT CRT Sub Study	CRT-D, women (QRS ≥150ms)	Hospitalization for heart failure	NR	7 years	NR	NR	NR	HR: 0.24 95% CI: 0.14 to 0.42, p=0.41
Zareba,2011 ²⁴ MADIT CRT Sub Study	LBBB	Hospitalization for heart failure	1281	6 months	NR	NR	NR	HR: 0.41 95% CI: 0.31- 0.54
Zareba,2011 ²⁴ MADIT CRT Sub Study	Non LBBB	Hospitalization for heart failure	536	6 months	NR	NR	NR	HR: 1.23 95% CI: 0.76-1.68
Zareba,2011 ²⁴ MADIT CRT Sub Study	RBBB	Hospitalization for heart failure	228	6 months	NR	NR	NR	HR: 0.88 95% CI: 0.46-1.67
Zareba,2011 ²⁴ MADIT CRT Sub Study	IVCD	Hospitalization for heart failure	308	6 months	NR	NR	NR	HR: 1.31 95% CI: 0.78-2.18
Higgins,2003 ⁶⁵ VENTAK CHF/CONTAK CD	CRT	Hospitalization for heart failure	245	6 months	32(13.1)	NR	NR	NR

Table D15: Outcomes reported in the trials assessing effectiveness of CRT-D (Hospitalization for heart failure and All-cause mortality)
(continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Higgins,2003 ⁶⁵ VENTAK CHF/CONTAK CD	No CRT	Hospitalization for heart failure	245	6 months	39(16)	NR	NR	NR
Biton, 2016 ¹³ MADIT study	ICD (aggregated arms)	Hospitalization for heart failure	199	7 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT study	CRT-D (aggregated arms)	Hospitalization for heart failure	328	7 years	NR	NR	NR	HR: 1 95% CI: 0.97 to 1.02, p=0.765
Biton, 2016 ¹³ MADIT study	ICD (QRS <150msec)	Hospitalization for heart failure	139	7 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT study	CRT-D (QRS <150msec)	Hospitalization for heart failure	204	7 years	NR	NR	NR	HR: 1.21 95% CI: 0.79 to 1.87, p=0.385
Biton, 2016 ¹³ MADIT study	ICD (QRS ≥150msec)	Hospitalization for heart failure	70	7 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT study	CRT-D (QRS ≥150msec)	Hospitalization for heart failure	124	7 years	NR	NR	NR	HR: 0.88 95% CI: 0.50 to 1.52, p=0.637
Biton, 2016 ¹³ MADIT study	ICD (Quartile1 QRS ≤134msec)	Hospitalization for heart failure	49	5 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT study	CRT-D (Quartile1 QRS ≤134msec)	Hospitalization for heart failure	81	5 years	NR	NR	NR	HR: 2.04 95% CI: 0.93 to 4.44, p=0.074

**Table D15: Outcomes reported in the trials assessing effectiveness of CRT-D (Hospitalization for heart failure and All-cause mortality)
(continued)**

Author, Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Biton, 2016 ¹³ MADIT study	ICD (Quartile2-4 QRS >134msec)	Hospitalization for heart failure	160	5 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT study	CRT-D (Quartile2-4 QRS >134msec)	Hospitalization for heart failure	247	5 years	NR	NR	NR	HR: 0.9 95% CI: 0.62 to 1.32, p=0.592
Biton, 2016 ¹³ MADIT study	ICD and RBBB	Hospitalization for heart failure	92	NR	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT study	CRT-D and RBBB	Hospitalization for heart failure	136	NR	NR	NR	NR	HR: 0.86 95% CI: 0.48 to 1.55, p=0.618
Biton, 2016 ¹³ MADIT study	ICD and IVCD	Hospitalization for heart failure	NR	NR	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT study	CRT-D and IVCD	Hospitalization for heart failure	NR	NR	NR	NR	NR	HR: 0.22 95% CI: 0.80 tp 1.86, p=0.356
Biton, 2015 ¹² MADIT study	ICD, men (QRS ≥150ms)	Hospitalization for heart failure	NR	7 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT study	CRT-D, men (QRS ≥150ms)	Hospitalization for heart failure	NR	7 years	NR	NR	NR	HR: 0.41 95% CI: 0.29 to 0.58, p=0.107
Biton, 2015 ¹² MADIT study	ICD, women (QRS <150ms)	Hospitalization for heart failure	NR	7 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT study	CRT-D, women (QRS <150ms)	Hospitalization for heart failure	NR	7 years	NR	NR	NR	HR: 0.22 95% CI: 0.08 to 0.58, p=0.002

**Table D15: Outcomes reported in the trials assessing effectiveness of CRT-D (Hospitalization for heart failure and All-cause mortality)
(continued)**

Author, Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Biton, 2015 ¹² MADIT study	ICD, women (QRS ≥150ms)	Hospitalization for heart failure	NR	7 years	NR	NR	NR	Reference
Biton, 2016 ¹³ MADIT study	CRT-D, women (QRS ≥150ms)	Hospitalization for heart failure	NR	7 years	NR	NR	NR	HR: 0.24 95% CI: 0.14 to 0.42, p=0.41

CRT-P=Cardiac Resynchronization Therapy Paced, CRT-D=Cardiac Resynchronization Therapy with Defibrillator, ICD=Implantable Cardioverter Defibrillator, N=Number, HR=Hazard Ratio, CI=Confidence Interval, OR=Odds Ratio, RD=Risk Difference, P=P value, NA=Not Applicable, LBBB=Left Bundle Branch Block, LVEF=Left Ventricular Ejection Fraction, CABG=Coronary Artery Bypass Graft, CRT=Cardiac Resynchronization Therapy, Biv=Bi-Ventricular, RV=Right Ventricular, IHD=Ischemic Heart Disease, NR=Not Reported, SD=Standard Deviation, NA=Not Applicable

Table D16: Harms reported in the studies assessing effectiveness of CRT-D

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Procedure related complications								
Echouffo-Tcheugui, 2016 ⁵⁷	Non-diabetes mellitus	Procedure related complications - not specified	11345	90 days	504(4.44)	NR	NR	NR
Echouffo-Tcheugui, 2016 ⁵⁷	Diabetes Mellitus	Procedure related complications - not specified	7083	90 days	259(3.66)	NR	NR	NR
Essebag, 2015 ²⁷	ICD substudy upgrade to CRT-D	Procedure related complications - not specified	60	Mean: 40 months	0(0)	NR	NR	NR
Essebag, 2015 ²⁷	ICD substudy upgrade to CRT-D	Procedure related complications - not specified	60	30 days	2(3.3)	NR	NR	NR
Friedman, 2015 ⁵⁹	ICD --CKD STAGE-3-5	Procedure related complications - not specified	1421	in hospital	82(5.8)	NR	NR	p=0.51
Friedman, 2015 ⁵⁹	CRT-D -CKD STAGE-3-5	Procedure related complications - not specified	9525	in hospital	571(6)	NR	NR	NR
Friedman, 2015 ⁵⁹	ICD --CKD STAGE-3-5	Procedure related complications - not specified	1421	30 day	67(4.7)	NR	NR	p=0.57
Friedman, 2015 ⁵⁹	CRT-D -CKD STAGE-3-5	Procedure related complications - not specified	9525	30 day	474(5)	NR	NR	NR

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Friedman, 2015 ⁵⁹	ICD --CKD STAGE-3-5	Procedure related complications - not specified	1421	90 day	5(0.4)	NR	NR	p=0.84
Friedman, 2015 ⁵⁹	CRT-D -CKD STAGE-3-5	Procedure related complications - not specified	9525	90 day	31(0.3)	NR	NR	NR
Hoke, 2014 ⁶⁶	Overall	procedure related complications - not specified	798	0-24 hrs	23(2.9)	NR	NR	p=0.552
Hoke, 2014 ⁶⁶	Age <75 Y - CRT-ICD	Procedure related complications - not specified	590	0-24 hrs	16(2.7)	NR	NR	NR
Hoke, 2014 ⁶⁶	Age ≥75 Y - CRT-ICD	Procedure related complications - not specified	208	0-24 hrs	7(3.3)	NR	NR	NR
Hoke, 2014 ⁶⁶	Overall	Procedure related complications - not specified	798	24 h to 30 d	20(2.5)	NR	NR	p=0.984
Hoke, 2014 ⁶⁶	Age <75 Y - CRT-ICD	Procedure related complications - not specified	590	24 h to 30 d	15(2.5)	NR	NR	NR
Hoke, 2014 ⁶⁶	Age ≥75 Y - CRT-ICD	Procedure related complications - not specified	208	24 h to 30 d	5(2.4)	NR	NR	NR

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Khazanie, 2016 ⁶⁸	ICD	Procedure related complications - not specified	2481	in hospital	60(2)	NR	NR	NR
Khazanie, 2016 ⁶⁸	CRT-D	Procedure related complications - not specified	6470	in hospital	228(4)	NR	NR	p=0.008
Khazanie, 2016 ⁶⁸	ICD	Procedure related complications - not specified	2481	90 day	67(2.7)	NR	NR	p=Ref
Khazanie, 2016 ⁶⁸	CRT-D	Procedure related complications - not specified	6470	90 day	196(3)	NR	NR	HR: 0.88, 95% CI: 0.60 to 1.29, p=0.51
Looi, 2017 ⁸⁰	ICD	Procedure related complications - not specified	269	24 hours	3(1.5)	NR	NR	p=0.02
Looi, 2017 ⁸⁰	CRT-D	Procedure related complications - not specified	116	24 hours	6(5.2)	NR	NR	p=0.02
Steffel, 2015 ⁹⁶	CRT-D-ON 120-130	Procedure related complications - not specified	65	6 months	8(12.31)	NR	NR	NR
Steffel, 2015 ⁹⁶	CRT--OFF 120-130	Procedure related complications - not specified	74	6 months	5(6.76)	NR	NR	NR

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Gilis,2014 ²⁸ RAFT Sub Study	ICD	Procedure related complications - not specified	904	NR	147(16.4)	159(NR)	NR	NR
Gilis,2014 ²⁸ RAFT Sub Study	ICD-CRT	Procedure related complications - not specified	894	NR	126(13.9)	246(NR)	NR	NR
Gopalapurugan,2014 ⁶²	CRT-D	Procedure related complications - not specified	117	NA	41(35)	NR	NR	HR: NR 95%CI: NR p: 0.74
Gopalapurugan,2014 ⁶²	ICD	Procedure related complications - not specified	63	NA	24(38.1)	NR	NR	NR
Jamerson,2014 ¹⁷	Males-ICD	Procedure related complications - not specified	NR	</=30 days	14(2.5)	NR	NR	NR
Length of hospital stay								
Gilis,2014 ²⁸ RAFT Sub Study	ICD	Length of hospital stay 14896Days	904	NR	NR	NR	NR	NR
Gilis,2014 ²⁸ RAFT Sub Study	ICD-CRT	Length of hospital stay 12783Days	894	NR	NR	NR	NR	NR

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Pneumothorax								
Adelstein, 2016 ⁴³	CRT-D ≥80 years old	Pneumothorax	258	Mean: 52 (SD 36 months)	0(0)	NR	NR	NR
Adelstein, 2016 ⁴³	CRT-D <80 years old	Pneumothorax	1058	Mean: 52 (SD 36 months)	7(0.7)	NR	NR	NR
Essebag, 2015 ²⁷	ICD substudy upgrade to CRT-D	Pneumothorax	60	Mean: 40 months	0(0)	NR	NR	NR
Friedman, 2015 ⁵⁹	ICD --CKD STAGE-3-5	Pneumothorax	NR	in hospital	15(1.1)	NR	NR	P=0.54
Friedman, 2015 ⁵⁹	CRT-D -CKD STAGE-3-5	Pneumothorax	NR	in hospital	90(0.9)	NR	NR	NR
Friedman, 2015 ⁵⁹	ICD --CKD STAGE-3-5	Pneumothorax	NR	30 day	17(1.2)	NR	NR	P=0.51
Friedman, 2015 ⁵⁹	CRT-D -CKD STAGE-3-5	Pneumothorax	NR	30 day	104(1.1)	NR	NR	NR
Hoke, 2014 ⁶⁶	Overall	Pneumothorax	798	0 to 24 h - inhospital	6(0.8)	NR	NR	P=0.158
Hoke, 2014 ⁶⁶	Age <75 Y - CRT-ICD	Pneumothorax	590	0 to 24 h - inhospital	3(0.5)	NR	NR	NR
Hoke, 2014 ⁶⁶	Age ≥75 Y - CRT-ICD	Pneumothorax	208	0 to 24 h - inhospital	3(1.4)	NR	NR	NR
Auricchio,2014 ⁴⁴	All patients	Pneumothorax	521	13 months	NR	(0.8)	NR	NR
Duray,2008 ⁵⁶	Overall	Pneumothorax	79	6 months	1(1.3)	NR	NR	NR
Kuhlkamp, 2002 ⁷⁵	Overall	Pneumothorax	81	Median: 185 days	2(NR)	2(NR)	NR	NR
Masoudi,2014 ⁸³	CRTD	Pneumothorax	NR	36 months	62(1.9)	NR	NR	HR: 1.9 95%CI: 1.07- 3.37 p: 0.004

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Moss,2009 ⁹	CRT-D	Pneumothorax	NR	30 days	NR(1.7)	NR	NR	NR
Moss,2009 ⁹	ICD	Pneumothorax	NR	30 days	NR(0.8)	NR	NR	NR
Ruwald,2014 ¹⁹	Overall	Pneumothorax	752	>12 months	109(14.5)	NR	NR	NR
Strimel, 2011 ⁹⁷	CRT-D	Pneumothorax	42	34 months (mean)	0	0	NR	NR
Strimel, 2011 ⁹⁷	Dual ICD	Pneumothorax	37	34 months (mean)	0	0	NR	NR
Vado,2014 ¹⁰²	Overall	Pneumothorax	45	>9 months	3(6.7)	NR	NR	NR
Pocket hematoma								
Adelstein, 2016 ⁴³	CRT-D ≥80 years old	Pocket hematoma	258	Mean: 52 (SD 36 months)	2(0.8)	NR	NR	NR
Adelstein, 2016 ⁴³	CRT-D <80 years old	Pocket hematoma	1058	Mean: 52 (SD 36 months)	10(0.9)	NR	NR	NR
Essebag, 2015 ²⁷	ICD substudy upgrade to CRT-D	Pocket hematoma	60	Mean: 40 months	0(0)	NR	NR	NR
Friedman, 2015 ⁵⁹	ICD --CKD STAGE-3-5	Pocket hematoma	1421	in hospital	33(2.3)	NR	NR	p=0.23
Friedman, 2015 ⁵⁹	CRT-D -CKD STAGE-3-5	Pocket hematoma	9525	in hospital	239(2.5)	NR	NR	NR
Friedman, 2015 ⁵⁹	ICD --CKD STAGE-3-5	Pocket hematoma	1421	30 day	43(3)	NR	NR	p=0.53
Friedman, 2015 ⁵⁹	CRT-D -CKD STAGE-3-5	Pocket hematoma	9525	30 day	302(3.2)	NR	NR	NR
Hoke, 2014 ⁶⁶	Overall	Pocket hematoma	798	0 to 24 h - inhospital	4(0.5)	NR	NR	p=0.25
Hoke, 2014 ⁶⁶	Age <75 Y - CRT-ICD	Pocket hematoma	590	0 to 24 h - inhospital	2(0.3)	NR	NR	NR

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Hoke, 2014 ⁶⁶	Age ≥75 Y - CRT-ICD	Pocket hematoma	208	0 to 24 h - inhospital	2(1)	NR	NR	NR
Hoke, 2014 ⁶⁶	Overall	Pocket hematoma	798	24 h to 30 d	2(1)	NR	NR	p=0.418
Hoke, 2014 ⁶⁶	Age <75 Y - CRT-ICD	Pocket hematoma	590	24 h to 30 d	1(0.2)	NR	NR	NR
Hoke, 2014 ⁶⁶	Age ≥75 Y - CRT-ICD	Pocket hematoma	208	24 h to 30 d	1(0.5)	NR	NR	NR
Looi, 2017 ⁸⁰	ICD	Pocket hematoma	269	2 weeks	2(0.7)	NR	NR	NR
Looi, 2017 ⁸⁰	CRT-D	Pocket hematoma	116	2 weeks	0(0)	NR	NR	NR
Auricchio,2014 ⁴⁴	All patients	Pocket hematoma	521	13 months	NR	(2.8)	NR	NR
Duray,2008 ⁵⁶	Overall	Pocket hematoma	79	6 months	1(1.3)	NR	NR	NR
Gilis,2014 ²⁸ RAFT Sub Study	ICD	Pocket hematoma	904	NR	NR	3(NR)	NR	NR
Gilis,2014 ²⁸ RAFT Sub Study	ICD-CRT	Pocket hematoma	894	NR	NR	8(NR)	NR	NR
Moss,2009 ⁹	CRT-D	Pocket hematoma	NR	30 days	NR(3.3)	NR	NR	NR
Moss,2009 ⁹	ICD	Pocket hematoma	NR	30 days	NR(2.5)	NR	NR	NR
Strimel, 2011 ⁹⁷	CRT-D	Pocket hematoma	42	34 months (mean)	2	2	NR	NR
Strimel, 2011 ⁹⁷	Dual ICD	Pocket hematoma	37	34 months (mean)	2	2	NR	NR

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Device infection								
Adelstein, 2016 ⁴³	CRT-D ≥80 years old	Device Infection	258	Mean: 52 (SD 36 months)	6(2.3)	NR	NR	NR
Adelstein, 2016 ⁴³	CRT-D <80 years old	Device Infection	1058	Mean: 52 (SD 36 months)	39(3.7)	NR	NR	NR
Essebag, 2015, 14782	ICD substudy upgrade to CRT-D	Device Infection	60	Mean: 40 months	0(0)	NR	NR	NR
Friedman, 2015 ⁵⁹	ICD --CKD STAGE-3-5	Device Infection	1421	90 day	5(0.4)	NR	NR	p=0.84
Friedman, 2015 ⁵⁹	CRT-D -CKD STAGE-3-5	Device Infection	9525	90 day	31(0.3)	NR	NR	NR
Hoke, 2014 ⁶⁶	Overall	Device Infection	798	24 h to 30 d	4(0.5)	NR	NR	p=0.995
Hoke, 2014 ⁶⁶	Age <75 Y - CRT-ICD	Device Infection	590	24 h to 30 d	3(0.5)	NR	NR	NR
Hoke, 2014 ⁶⁶	Age ≥75 Y - CRT-ICD	Device Infection	208	24 h to 30 d	1(0.5)	NR	NR	NR
Looi, 2017 ⁸⁰	ICD	Device Infection	269	>2 weeks	4(1.5)	NR	NR	p=0.62
Looi, 2017 ⁸⁰	CRT-D	Device Infection	116	>2 weeks	1(0.9)	NR	NR	p=0.62
Ziacchi, 2018 ¹⁰⁵	Overall	Device Infection	290	12 months	2(0.7)	NR	NR	p=0.84
Ziacchi, 2018 ¹⁰⁵	Bipolar leads	Device Infection	136	12 months	1(0.7)	NR	NR	p=0.84
Ziacchi, 2018 ¹⁰⁵	Quadripolar leads	Device Infection	97	12.1	1(1)	NR	NR	p=0.84
Ziacchi, 2018 ¹⁰⁵	Active Fixation leads	Device Infection	57	10.4	0(0)	NR	NR	p=0.84
Auricchio,2014 ⁴⁴	All patients	Device Infection	521	13 months	NR	(1.8)	NR	NR
Bossard,2014 ⁴⁹	All patients	Device Infection	49	NR	NR	2(NR)	NR	NR
Duray,2008 ⁵⁶	Overall	Device Infection	79	6 months	0(0)	NR	NR	NR

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Gilis,2014 ²⁸ RAFT Sub Study	ICD	Device Infection	904	NR	NR	20(NR)	NR	NR
Gilis,2014 ²⁸ RAFT Sub Study	ICD-CRT	Device Infection	894	NR	NR	25(NR)	NR	NR
Haugaa,2014 ⁶⁴	Overall	Device Infection	266	24 months	39(15)	NR	NR	NR
Jamerson,2014 ¹⁷	Females CRTD	Device Infection	NR	</=30 days	2(0.7)	NR	NR	NR
Jamerson,2014 ¹⁷	Females CRTD	Device Infection	NR	</=30 days	7(2.5)	NR	NR	NR
Jamerson,2014 ¹⁷	Females ICD	Device Infection	NR	</=30 days	0(0)	NR	NR	HR: NR 95%CI: NR p: 0.05
Jamerson,2014 ¹⁷	Females ICD	Device Infection	NR	</=30 days	2(1.1)	NR	NR	NR
Jamerson,2014 ¹⁷	Males-CRTD	Device Infection	NR	</=30 days	5(0.6)	NR	NR	NR
Jamerson,2014 ¹⁷	Males-ICD	Device Infection	NR	</=30 days	3(0.5)	NR	NR	NR
Knight,2004 ⁷¹	Overall	Device Infection	443	NR	5(1.1)	NR	NR	NR
Kuhlkamp, 2002 ⁷⁵	Overall	Device Infection	81	Median: 185 days	2(NR)	2(NR)	NR	NR
Landolina,2011 ⁷⁷	Overall	Device Infection	3253	NR	30(0.92)	NR	NR	NR
Masoudi,2014 ⁸³	ICD	Device Infection	NR	12 months	24(0.7)	NR	NR	HR: NR 95%CI: NR p: 0.012
Moss,2009 ⁹	CRT-D	Device Infection	NR	30 days	NR(1.1)	NR	NR	NR
Moss,2009 ⁹	ICD	Device Infection	NR	30 days	NR(0.7)	NR	NR	NR
Strimel, 2011 ⁹⁷	CRT-D	Device Infection	42	34 months (mean)	0	1	NR	NR
Strimel, 2011 ⁹⁷	Dual ICD	Device Infection	37	34 months (mean)	1	0	NR	NR

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author, Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Cardiac perforation/tamponade								
Adelstein, 2016 ⁴³	CRT-D ≥80 years old (cardiac perforation)	Cardiac perforation/ tamponade	258	Mean: 52 (SD 36 months)	1(0.4)	NR	NR	NR
Adelstein, 2016 ⁴³	CRT-D <80 years old (cardiac perforation)	Cardiac perforation/ tamponade	1058	Mean: 52 (SD 36 months)	5(0.5)	NR	NR	NR
Adelstein, 2016 ⁴³	CRT-D ≥80 years old (pericardial eff with tamponade)	Cardiac perforation/ tamponade	258	Mean: 52 (SD 36 months)	1(0.4)	NR	NR	NR
Adelstein, 2016 ⁴³	CRT-D <80 years old (pericardial eff with tamponade)	Cardiac perforation/ tamponade	1058	Mean: 52 (SD 36 months)	0(0)	NR	NR	NR
Essebag, 2015 ²⁷	ICD substudy upgrade to CRT-D	Cardiac perforation/ tamponade	60	Mean: 40 months	0(0)	NR	NR	NR
Friedman, 2015 ⁵⁹	ICD --CKD STAGE-3-5	Cardiac perforation/ tamponade	1421	in hospital	13(0.9)	NR	NR	p=0.1
Friedman, 2015 ⁵⁹	CRT-D -CKD STAGE-3-5	Cardiac perforation/ tamponade	9525	in hospital	58(0.6)	NR	NR	NR
Friedman, 2015 ⁵⁹	ICD --CKD STAGE-3-5	Cardiac perforation/ tamponade	1421	30 day	16(1.1)	NR	NR	p=0.07
Friedman, 2015 ⁵⁹	CRT-D -CKD STAGE-3-5	Cardiac perforation/ tamponade	9525	30 day	87(0.9)	NR	NR	NR

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Hoke, 2014 ⁶⁶	Overall	Cardiac perforation/ tamponade	798	0 to 24 h - inhospital	2(0.3)	NR	NR	p=0.563
Hoke, 2014 ⁶⁶	Age <75 Y - CRT-ICD	Cardiac perforation/ tamponade	590	0 to 24 h - inhospital	1(0.2)	NR	NR	NR
Hoke, 2014 ⁶⁶	Age ≥75 Y - CRT-ICD	Cardiac perforation/ tamponade	208	0 to 24 h - inhospital	1(0.5)	NR	NR	NR
Looi, 2017 ⁸⁰	ICD	Cardiac perforation/ tamponade	269	24 hours	1(0.4)	NR	NR	p=0.28
Looi, 2017 ⁸⁰	CRT-D	Cardiac perforation/ tamponade	116	24 hours	1(0.9)	NR	NR	p=0.28
Abraham,2004 ⁴¹ MIRACLE ICD II	Overall	Cardiac perforation/ tamponade	210	From time of procedure to hospital discharge	3(1.4)	NR	NR	NR
Abraham,2004 ⁴¹ MIRACLE ICD II	Overall	Cardiac perforation/ tamponade	191	6 months	1(0.5)	NR	NR	NR
Duray,2008 ⁵⁶	Overall	Cardiac perforation/ tamponade	79	6 months	0(0)	NR	NR	NR
Gilis,2014 ²⁸ RAFT Sub Study	ICD	Cardiac perforation/ tamponade	904	NR	NR	1(NR)	NR	NR
Gilis,2014 ²⁸ RAFT Sub Study	ICD-CRT	Cardiac perforation/ tamponade	894	NR	NR	1(NR)	NR	NR

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Jamerson,2014 ¹⁷	Females CRTD	Cardiac perforation/ tamponade	NR	</=30 days	1(0.3)	NR	NR	NR
Jamerson,2014 ¹⁷	Females ICD	Cardiac perforation/ tamponade	NR	</=30 days	0(0)	NR	NR	NR
Jamerson,2014 ¹⁷	Males-CRTD	Cardiac perforation/ tamponade	NR	</=30 days	3(0.3)	NR	NR	NR
Jamerson,2014 ¹⁷	Males-ICD	Cardiac perforation/ tamponade	NR	</=30 days	2(0.3)	NR	NR	NR
Strimel, 2011 ⁹⁷	CRT-D	Cardiac perforation/ tamponade	42	34 months (mean)	1	1	NR	NR
Strimel, 2011 ⁹⁷	Dual ICD	Cardiac perforation/ tamponade	37	34 months (mean)	0	0	NR	NR
Lead Dislodgement								
Adelstein, 2016 ⁴³	CRT-D ≥80 years old	Lead dislodgement	258	Mean: 52 (SD 36 months)	16(6.2)	NR	NR	NR
Adelstein, 2016 ⁴³	CRT-D <80 years old	Lead dislodgement	1058	Mean: 52 (SD 36 months)	58(5.5)	NR	NR	NR
Crossley, 2015 ⁵³	CRT-D -4298	Lead dislodgement	499	6 MONTHS	10(2)	NR	NR	NR
Essebag, 2015 ²⁷	ICD substudy upgrade to CRT-D	Lead dislodgement	60	Mean: 40 months	1(1.7)	NR	NR	NR

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Hoke, 2014 ⁶⁶	Overall	Lead dislodgement	798	0 to 24 h - inhospital	11(1.4)	NR	NR	p=0.218
Hoke, 2014 ⁶⁶	Age <75 Y - CRT-ICD	Lead dislodgement	590	0 to 24 h - inhospital	10(1.7)	NR	NR	NR
Hoke, 2014 ⁶⁶	Age ≥75 Y - CRT-ICD	Lead dislodgement	208	0 to 24 h - inhospital	1(0.5)	NR	NR	NR
Hoke, 2014 ⁶⁶	Overall	Lead dislodgement	798	24 h to 30 d	14(1.8)	NR	NR	p=0.748
Hoke, 2014 ⁶⁶	Age <75 Y - CRT-ICD	Lead dislodgement	590	24 h to 30 d	11(1.9)	NR	NR	NR
Hoke, 2014 ⁶⁶	Age ≥75 Y - CRT-ICD	Lead dislodgement	208	24 h to 30 d	3(1.4)	NR	NR	NR
Looi, 2017 ⁸⁰	ICD	Lead dislodgement	269	24 hours	3(1.5)	NR	NR	p=0.02
Looi, 2017 ⁸⁰	CRT-D	Lead dislodgement	116	24 hours	6(5.2)	NR	NR	p=0.02
Looi, 2017 ⁸⁰	ICD	Lead dislodgement	269	2 weeks	2(0.7)	NR	NR	p=0.9
Looi, 2017 ⁸⁰	CRT-D	Lead dislodgement	116	2 weeks	1(0.9)	NR	NR	p=0.9
Looi, 2017 ⁸⁰	ICD	Lead dislodgement	269	>2 weeks	6(2.2)	NR	NR	p=0.38
Looi, 2017 ⁸⁰	CRT-D	Lead dislodgement	116	>2 weeks	4(4.3)	NR	NR	p=0.38
Ziacchi, 2018 ¹⁰⁵	Overall	Lead dislodgement	290	12 months	27(9)	NR	NR	p=0.0003
Ziacchi, 2018 ¹⁰⁵	Bipolar leads	Lead dislodgement	136	12 months	21(15)	NR	NR	p=0.0003
Ziacchi, 2018 ¹⁰⁵	Quadripolar leads	Lead dislodgement	97	12.1	5(5)	NR	NR	p=0.0003
Ziacchi, 2018 ¹⁰⁵	Active Fixation leads	Lead dislodgement	57	10.4	0(0)	NR	NR	p=0.0003

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Ziacchi, 2018 ¹⁰⁵	Overall	Lead dislodgement requiring reop	290	12 months	14(4.8)	NR	NR	p=0.005
Ziacchi, 2018 ¹⁰⁵	Bipolar leads	Lead dislodgement requiring reop	136	12 months	10(7.4)	NR	NR	p=0.005
Ziacchi, 2018 ¹⁰⁵	Quadripolar leads	Lead dislodgement requiring reop	97	12.1	4(4.1)	NR	NR	p=0.005
Ziacchi, 2018 ¹⁰⁵	Active Fixation leads	Lead dislodgement requiring reop	57	10.4	0(0)	NR	NR	p=0.005
Abraham,2004 ⁴¹ MIRACLE ICD II	Overall	Lead dislodgement	210	From time of procedure to hospital discharge	5(2.4)	NR	NR	NR
Abraham,2004 ⁴¹ MIRACLE ICD II	Overall	Lead dislodgement	191	6 months	11(5.8)	NR	NR	NR
Auricchio,2014 ⁴⁴	All patients	Lead dislodgement	521	13 months	NR	(9.8)	NR	NR
Bossard,2014 ⁴⁹	All patients	Lead dislodgement	49	NR	NR	4(NR)	NR	NR
Kuhlkamp, 2002 ⁷⁵	Overall	Lead dislodgement	81	Median: 185 days	1(NR)	1(NR)	NR	NR
Kuhlkamp, 2002 ⁷⁵	Overall	Lead dislodgement	81	Median: 185 days	2(NR)	2(NR)	NR	NR
Kuhlkamp, 2002 ⁷⁵	Overall	Lead dislodgement	81	Median: 185 days	4(NR)	4(NR)	NR	NR
Kuhlkamp, 2002 ⁷⁵	Overall	Lead dislodgement	81	Median: 185 days	1(NR)	1(NR)	NR	NR
Masoudi,2014 ⁸³	CRTD	Lead dislodgement	NR	12 months	45(1.3)	NR	NR	NR

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Strimel, 2011 ⁹⁷	CRT-D	Lead dislodgement	42	34 months (mean)	1	1	NR	NR
Strimel, 2011 ⁹⁷	Dual ICD	Lead dislodgement	37	34 months (mean)	1	1	NR	NR
Ventricular Arrhythmias								
Abraham,2004 ⁴¹ MIRACLE ICD II	Control	Ventricular arrhythmias	101	6 months	26(26)	NR	NR	NR
Abraham,2004 ⁴¹ MIRACLE ICD II	CRT	Ventricular arrhythmias	85	6 months	19(22)	NR	NR	NR
Biton, 2018 ¹⁴	QRST tertile 1	Ventricular arrhythmias	306	4 years	NR	88(28.8)	NR	Reference
Biton, 2018 ¹⁴	QRST tertile 1	Ventricular arrhythmias	306	4 years	NR	95(31.0)	NR	Reference
Biton, 2018 ¹⁴	QRST tertile 1	Ventricular arrhythmias	306	4 years	NR	118(38.6)	NR	Reference
Biton, 2018 ¹⁴	QRST tertile 2	Ventricular arrhythmias	306	4 years	NR	55(18.0)	NR	HR: 0.65 95% CI: 0.45 to 0.92, p=0.016
Biton, 2018 ¹⁴	QRST tertile 2	Ventricular arrhythmias	306	4 years	NR	63(20.6)	NR	HR: 0.67 95% CI: 0.47 to 0.93, p=0.018
Biton, 2018 ¹⁴	QRST tertile 2	Ventricular arrhythmias	306	4 years	NR	81(26.5)	NR	HR: 0.74 95% CI: 0.54 to 0.98, p=0.048
Biton, 2018 ¹⁴	QRST tertile 3	Ventricular arrhythmias	303	4 years	NR	41(13.5)	NR	HR: 0.45 95% CI: 0.30 to 0.69, p=<0.001
Biton, 2018 ¹⁴	QRST tertile 3	Ventricular arrhythmias	303	4 years	NR	47(15.5)	NR	HR: 0.45 95% CI: 0.30 to 0.67, p=<0.001

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author, Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Biton, 2018 ¹⁴	QRST tertile 3	Ventricular arrhythmias	303	4 years	NR	64(21.1)	NR	HR: 0.54 95% CI: 0.38 to 0.77, p=0.001
Biton, 2018 ¹⁴	TOTAL	Ventricular arrhythmias	915	4 years	NR	163(17.8)	NR	NR
Bossard, 2014 ⁴⁹	All patients	Ventricular arrhythmias	49	NR	14(28.6)	NR	NR	NR
Gasparini, 2009 ⁶¹	Control	Ventricular arrhythmias	160	NR	NR	310(NR)	NR	NR
Gasparini, 2009 ⁶¹	Protect	Ventricular arrhythmias	164	NR	NR	311(NR)	NR	NR
Higgins, 2003 ⁶⁵ VENTAK CHF/CONTAK CD	CRT	Ventricular arrhythmias	117	6 months	36(30.8)	NR	NR	NR
Higgins, 2003 ⁶⁵ VENTAK CHF/CONTAK CD	No CRT	Ventricular arrhythmias	110	6 months	39(35.5)	NR	NR	NR
Jamerson, 2014 ¹⁷	Females CRTD	Ventricular arrhythmias	NR	</=30 days	23(7.7)	NR	NR	NR
Jamerson, 2014 ¹⁷	Females ICD	Ventricular arrhythmias	NR	</=30 days	5(2.9)	NR	NR	HR: NR 95%CI: NR p: 0.018
Jamerson, 2014 ¹⁷	Males-CRTD	Ventricular arrhythmias	NR	</=30 days	23(2.9)	NR	NR	HR: NR 95%CI: NR p: <0.001
Jamerson, 2014 ¹⁷	Males-CRTD	Ventricular arrhythmias	NR	</=30 days	5(0.6)	NR	NR	NR
Jamerson, 2014 ¹⁷	Males-ICD	Ventricular arrhythmias	NR	</=30 days	3(0.5)	NR	NR	NR
Kronborg, 2018 ⁷⁴		Ventricular arrhythmias	1643	2 years	322(19.6)	NR	NR	NR

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Looi, 2017 ⁸⁰	CRT-D	Ventricular arrhythmias	116	2.67 year mean	10(8.6)	NR	NR	p=0.07
Looi, 2017 ⁸⁰	ICD	Ventricular arrhythmias	269	2.67 years mean	33(12.3)	NR	NR	p=0.07
Nian-Sang,2010 ⁸⁷	Overall(CRT-D)	Ventricular arrhythmias	54	3 days	4(7.4)	NR	NR	NR
Ouellet,2012 ¹⁸ MADIT CRT Sub Study	CRT-D	Ventricular arrhythmias	1089	NR	166(15.2)	NR	NR	NR
Ouellet,2012 ¹⁸ MADIT CRT Sub Study	ICD	Ventricular arrhythmias	731	NR	161(22)	NR	NR	NR
Pinter,2009 ⁸⁸	CRT OFF	Ventricular arrhythmias	36	6 months	6(16.7)	NR	NR	NR
Pinter,2009 ⁸⁸	CRT ON	Ventricular arrhythmias	36	6 months	7(19.4)	NR	NR	NR
Sabbag, 2016 ²⁰	CRT-D in blacks	Ventricular arrhythmias	55	48 months	NR	NR	NR	p=0.174
Sabbag, 2016 ²⁰	CRT-D in whites	Ventricular arrhythmias	690	48 months	NR	NR	NR	p=0.002
Sabbag, 2016 ²⁰	ICD in blacks	Ventricular arrhythmias	36	48 months	NR	NR	NR	Reference
Sabbag, 2016 ²⁰	ICD in whites	Ventricular arrhythmias	463	48 months	NR	NR	NR	Reference
Sapp, 2017 ³⁰	Primary indication: CRT-D	Ventricular arrhythmias	759	Mean: 40.7±19.2 months	344(45.3)	NR	NR	p=0.044
Sapp, 2017 ³⁰	Primary indication: ICD	Ventricular arrhythmias	772	Mean: 40.7±19.2 months	383(49.6)	NR	NR	Reference
Sapp, 2017 ³⁰	Secondary indication: CRT-D	Ventricular arrhythmias	121	Mean: 40.7±19.2 months	79(65.3)	NR	NR	p=0.45

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Sapp, 2017 ³⁰	Secondary indication: ICD	Ventricular arrhythmias	112	Mean: 40.7±19.2 months	65(58)	NR	NR	Reference
Sardu, 2017 ⁹³	CRT-D (MS - metabolic syndrome)	Ventricular arrhythmias	46	12 months	3(7)	NR	NR	NR
Sardu, 2017 ⁹³	CRT-D -No MS	Ventricular arrhythmias	45	12 months	4(9)	NR	NR	p=0.405
Su, 2018 ⁹⁸	CRT-D, Right ventricular middle septum	Ventricular arrhythmias, LV lead in anterolateral cardiac vein	24	24 months	16 (66.7)	NR	NR	HR: 3.29 (95% CI: 1.33 to 8.16), p=0.01
Su, 2018 ⁹⁸	CRT-D, Right ventricular apical	Ventricular arrhythmias, LV lead in anterolateral cardiac vein	38	24 months	11(28.9)	NR	NR	Reference
Su, 2018 ⁹⁸	CRT-D, Right ventricular middle septum	Ventricular arrhythmias, LV lead in lateral cardiac vein	90	24 months	29(32.2)	NR	NR	HR: 0.93 (95% CI: 0.58 to 1.51), p=0.78
Su, 2018 ⁹⁸	CRT-D, Right ventricular apical	Ventricular arrhythmias, LV lead in lateral cardiac vein	115	24 months	42(36.5)	NR	NR	Reference
Su, 2018 ⁹⁸	CRT-D, Right ventricular middle septum	Ventricular arrhythmias, LV lead in posterolateral cardiac vein	41	24 months	16(39)	NR	NR	HR: 0.49 (95% CI: 0.26 to 0.90), p=0.02

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Su, 2018 ⁹⁸	CRT-D, Right ventricular apical	Ventricular arrhythmias, LV lead in posterolateral cardiac vein	44	24 months	29(65.9)	NR	NR	Reference
Su, 2018 ⁹⁸	CRT-D, Right ventricular middle septum	Ventricular arrhythmias, total	155	24 months	61(39.3)	NR	NR	NR (95% CI: NR), p=0.67
Su, 2018 ⁹⁸	CRT-D, Right ventricular apical	Ventricular arrhythmias, total	197	24 months	82(41.6)	NR	NR	NR (95% CI: NR), p=0.67
Theuns,2005 ¹⁰¹	Overall	Ventricular arrhythmias	86	NR	36(42)	724(NR)	NR	NR
Theuns,2005 ¹⁰¹	Primary prophylaxis	Ventricular arrhythmias	38	NR	7(18.4)	NR	NR	NR
Theuns,2005 ¹⁰¹	Secondary prophylaxis	Ventricular arrhythmias	48	NR	29(60.4)	NR	NR	NR
Zue, 2016 ¹⁰⁷	acute TpTe shorten group<0	Ventricular arrhythmias	43	1 year	11(26)	NR	NR	NR
Zue, 2016 ¹⁰⁷	acute TpTe shorten group>=0	Ventricular arrhythmias	58	1 year	11(19)	NR	NR	NR
Zue, 2016 ¹⁰⁷	Chronic TpTe non-shorten group<0	Ventricular arrhythmias	65	1 year	8(12)	NR	NR	NR
Zue, 2016 ¹⁰⁷	Chronic TpTe non-shorten group>=0	Ventricular arrhythmias	36	1 year	14(39)	NR	NR	NR

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Death (within a week)								
Adelstein, 2016 ⁴³	CRT-D ≥80 years old	Death (within a week)	258	Mean: 52 (SD 36 months)	0(0)	NR	NR	NR
Adelstein, 2016 ⁴³	CRT-D <80 years old	Death (within a week)	1058	Mean: 52 (SD 36 months)	0(0)	NR	NR	NR
Duray,2008 ⁵⁶	Overall	Death (within a week)	79	6 months	0(0)	NR	NR	NR
Friedman, 2015 ⁵⁹	ICD --CKD STAGE-3-5	Death (within a week)	1421	in hospital	2(0.1)	NR	NR	p=0.75
Friedman, 2015 ⁵⁹	CRT-D -CKD STAGE-3-5	Death (within a week)	9525	in hospital	23(0.2)	NR	NR	NR
Inappropriate ICD shocks								
Adelstein, 2016 ⁴³	CRT-D ≥80 years old	Inappropriate ICD shocks)	258	Mean: 52 (SD 36 months)	14(6)	NR	NR	NR
Adelstein, 2016 ⁴³	CRT-D <80 years old	Inappropriate ICD shocks)	1058	Mean: 52 (SD 36 months)	NR	NR	NR	NR
Bossard,2014 ⁴⁹	All patients	Inappropriate ICD shocks (CRT-D only)	49	NR	7(14.3)	NR	NR	NR
Boven,2013 ⁵⁰	Total study population	Inappropriate ICD shocks (CRT-D only)	543	NR	33(6.1)	NR	NR	NR
Boven,2013 ⁵¹	Functional Nonresponders	Inappropriate ICD shocks (CRT-D only)	100	NR	3(7.1)	NR	NR	NR
Boven,2013 ⁵¹	Functional Responders	Inappropriate ICD shocks (CRT-D only)	42	NR	9(9)	NR	NR	NR

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Gilis,2014 ²⁸ RAFT Sub Study	ICD	Inappropriate ICD shocks (CRT-D only)	904	NR	NR	30(NR)	NR	NR
Gilis,2014 ²⁸ RAFT Sub Study	ICD-CRT	Inappropriate ICD shocks (CRT-D only)	894	NR	NR	20(NR)	NR	NR
Killu, 2017 ⁶⁹	Non/modest responder	Inappropriate ICD shocks)	592	5 years	29(4.9)	NR	95% CI: 3.4 to 7.3%, p=ref	NR
Killu, 2017 ⁶⁹	Super responder	Inappropriate ICD shocks)	37	5 years	3(8.1)	NR	95% CI: 0 to 18.3%, p=0.46	NR
Kronborg, 2018 ⁷⁴	Overall	Inappropriate ICD shocks)	1643	2 Years	35(2)	NR	NR	NR
Ricci,2014 ⁸⁹	Overall	Inappropriate ICD shocks (CRT-D only)	1404	NR	102(7.3)	272(NR)	NR	NR
Su, 2018 ⁹⁸	CRT-D, Right ventricular middle septum	Inappropriate ICD shocks, LV lead in anterolateral cardiac vein	24	24 months	5(20.8)	NR	NR	HR: 0.68 (95% CI: 0.21 to 2.15), p=0.51
Su, 2018 ⁹⁸	CRT-D, Right ventricular apical	Inappropriate ICD shocks, LV lead in anterolateral cardiac vein	38	24 months	11(28.9)	NR	NR	Reference
Su, 2018 ⁹⁸	CRT-D, Right ventricular middle septum	Inappropriate ICD shocks, LV lead in lateral cardiac vein	90	24 months	22(24.4)	NR	NR	NR (95% CI: NR), p=0.87

Table D16: Harms reported in the studies assessing effectiveness of CRT-D (continued)

Author, Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Su, 2018 ⁹⁸	CRT-D, Right ventricular apical	Inappropriate ICD shocks, LV lead in lateral cardiac vein	115	24 months	27(23.5)	NR	NR	NR (95% CI: NR), p=0.87
Su, 2018 ⁹⁸	CRT-D, Right ventricular middle septum	Inappropriate ICD shocks, LV lead in posterolateral cardiac vein	41	24 months	13(31.7)	NR	NR	HR: 2.02 (95% CI: 0.80 to 5.10), p=0.14
Su, 2018 ⁹⁸	CRT-D, Right ventricular apical	Inappropriate ICD shocks, LV lead in posterolateral cardiac vein	44	24 months	11(25)	NR	NR	Reference
Su, 2018 ⁹⁸	CRT-D, Right ventricular middle septum	Inappropriate ICD shocks, total	155	24 months	39.99(25.8)	NR	NR	NR (95% CI: NR), p=0.84
Su, 2018 ⁹⁸	CRT-D, Right ventricular apical	Inappropriate ICD shocks, total	197	24 months	49.053(24.9)	NR	NR	NR (95% CI: NR), p=0.84

CRT-P=Cardiac Resynchronization Therapy Paced, CRT-D=Cardiac Resynchronization Therapy with Defibrillator, ICD=Implantable Cardioverter Defibrillator, N=Number, HR=Hazard Ratio, CI=Confidence Interval, OR=Odds Ratio, RD=Risk Difference, P=P value, NA=Not Applicable, LBBB=Left Bundle Branch Block, LVEF=Left Ventricular Ejection Fraction, CABG=Coronary Artery Bypass Graft, CRT=Cardiac Resynchronization Therapy, Biv=Bi-Ventricular, RV=Right Ventricular, IHD=Ischemic Heart Disease, NR=Not Reported, SD=Standard Deviation, NA=Not Applicable

Table D17: Outcomes reported in the trials assessing effectiveness of CRT P vs. D

Author,Year Trial	Arm(name)	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
6 minute hall walk distance									
Bristow,2004 ³⁴ COMPANION	Optimal Pharmacologica l Therapy	6 minute hall walk distance Unit:Meters	308	NR	3 months	170	NR	9	NR
Bristow,2004 ³⁴ COMPANION	Optimal Pharmacologica l Therapy	6 minute hall walk distance Unit:Meters	308	NR	6 months	142	NR	1	NR
Bristow,2004 ³⁴ COMPANION	CRT-P	6 minute hall walk distance Unit:Meters	617	NR	3 months	422	NR	33	NR
Bristow,2004 ³⁴ COMPANION	CRT-P	6 minute hall walk distance Unit:Meters	617	NR	6 months	373	NR	40	NR
Bristow,2004 ³⁴ COMPANION	CRT-D	6 minute hall walk distance Unit:Meters	595	NR	3 months	420	NR	44	NR
Bristow,2004 ³⁴ COMPANION	CRT-D	6 minute hall walk distance Unit:Meters	595	NR	3 months	378	NR	46	NR

Table D17: Outcomes reported in the trials assessing effectiveness of CRT P vs. D (continued)

Author,Year Trial	Arm(name)	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Minnesota Living with Heart Failure Inventory Score									
Cleland,2009 ⁴ CARE HF Sub Study	Medical Therapy alone	Minnesota Living with Heart Failure Inventory Score Unit:NA	404	Mean: 43.7 SD: NR	3 months	404	Mean: 38.9 SD: nr	NR	HR: -10.6 95% CI: -8.1to-13.1
Cleland,2009 ⁴ CARE HF Sub Study	CRT-P	Minnesota Living with Heart Failure Inventory Score Unit:NA	409	Mean: 44.6 SD: NR	3 months	409	Mean: 30.1 SD: nr	NR	NA
Cleland,2009 ⁴ CARE HF Sub Study	Medical Therapy alone	Minnesota Living with Heart Failure Inventory Score Unit:NA	404	Mean: 43.7 SD: NR	18 months	404	Mean: 36 SD: nr	NR	HR: -10.7 95% CI: -7.6 to-13.8
Cleland,2009 ⁴ CARE HF Sub Study	CRT-P	Minnesota Living with Heart Failure Inventory Score Unit:NA	409	Mean: 44.6 SD: NR	18 months	409	Mean: 28.4 SD: nr	NR	NA

Table D17: Outcomes reported in the trials assessing effectiveness of CRT P vs. D (continued)

CRT-P=Cardiac Resynchronization Therapy Paced, CRT-D=Cardiac Resynchronization Therapy with Defibrillator, ICD=Implantable Cardioverter Defibrillator, N=Number, HR=Hazard Ratio, CI=Confidence Interval, OR=Odds Ratio, RD=Risk Difference, P=P value, NA=Not Applicable, LBBB=Left Bundle Branch Block, LVEF=Left Ventricular Ejection Fraction, CABG=Coronary Artery Bypass Graft, CRT=Cardiac Resynchronization Therapy, Biv=Bi-Ventricular, RV=Right Ventricular, IHD=Ischemic Heart Disease, NR=Not Reported, SD=Standard Deviation, NA=Not Applicable

Table D18: Outcomes reported in the trials assessing effectiveness of CRT P vs. D (Hospitalization for heart failure and All-cause mortality)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Hospitalization for heart failure								
Anand, 2009 ³⁵	Arm 1	Hospitalization for heart failure	516	Median: 11.9 months	235(46)	NR	NR	NR
Anand, 2009 ³⁵	Arm 2	Hospitalization for heart failure	993	Median: 16.2 months	329(33)	NR	NR	NR
Anand, 2009 ³⁵	Arm 3	Hospitalization for heart failure	919	Median: 15.7 months	333(36)	NR	NR	NR
All-cause mortality								
Bristow,2004 ³⁴ COMPANION	Optimal Pharmacological Therapy	All-cause mortality	308	12 months	77(25)	NR	NR	HR: 0.76 95% CI: 0.58-1.01
Bristow,2004 ³⁴ COMPANION	CRT-P	All-cause mortality	617	12 months	NR	NR	NR	HR: 0.64 95% CI: 0.48-0.86
Bristow,2004 ³⁴ COMPANION	CRT-D	All-cause mortality	595	12 months	NR	NR	NR	NR
Carson,2005 ³⁶	Total	All-cause mortality	1510	NR	313(20.6)	NR	NR	NR
Carson,2005 ³⁶	Optimal Pharmacological therapy	All-cause mortality	308	NR	77(25)	NR	NR	NR
Carson,2005 ³⁶	CRT-P	All-cause mortality	617	NR	131(21.2)	NR	NR	NR
Carson,2005 ³⁶	CRT-D	All-cause mortality	595	NR	105(17.6)	NR	NR	NR

Table D18: Outcomes reported in the trials assessing effectiveness of CRT P vs. D (Hospitalization for heart failure and All-cause mortality) (continued)

Author, Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
All-cause mortality (continued)								
Shamoun, 2019 ³⁸ COMPANION Sub Study	CRT-D, LVEDDI <35	All-cause mortality	253	990 days	43(17)	NR	NR	HR: 0.86 (95% CI: 0.33 to 0.78), p=0.54
Shamoun, 2019 ³⁸ COMPANION Sub Study	CRT-P, LVEDDI <35	All-cause mortality	256	990 days	52(20.3)	NR	NR	HR: 0.95 (95% CI: 0.60 to 1.51), p=0.83
Shamoun, 2019 ³⁸ COMPANION Sub Study	OPT, LVEDDI <35	All-cause mortality	137	990 days	27(19.7)	NR	NR	Reference
Shamoun, 2019 ³⁸ COMPANION Sub Study	CRT-D, LVEDDI ≥35	All-cause mortality	233	990 days	56(24.0)	NR	NR	HR: 0.51 (95% CI: 0.33 to 0.78), p=0.002
Shamoun, 2019 ³⁸ COMPANION Sub Study	CRT-P, LVEDDI ≥35	All-cause mortality	265	990 days	59(22.3)	NR	NR	HR: 0.59 (95% CI: 0.39 to 0.90), p=0.012
Shamoun, 2019 ³⁸ COMPANION Sub Study	OPT, LVEDDI ≥35	All-cause mortality	116	990 days	37(31.9)	NR	NR	Reference

esynchronization Therapy Paced, CRT-D=Cardiac Resynchronization Therapy with Defibrillator, ICD=Implantable Cardioverter Defibrillator, N=Number, HR=Hazard Ratio, CI=Confidence Interval, OR=Odds Ratio, RD=Risk Difference, P=P value, NA=Not Applicable, LBBB=Left Bundle Branch Block, LVEF=Left Ventricular Ejection Fraction, CABG=Coronary Artery Bypass Graft, CRT=Cardiac Resynchronization Therapy, Biv=Bi-Ventricular, RV=Right Ventricular, IHD=Ischemic Heart Disease, NR=Not Reported, SD=Standard Deviation, NA=Not Applicable

Table D19: Harms reported in the studies assessing harms of CRT P vs. D

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Procedure related complications								
Barra, 2018 ⁴⁶	CRT-D	Procedure related complications - not specified	1785	Mean: 36.2 months	303(16.9)	NR	NR	OR: 1.2, 95% CI: 0.72 to 2.0, p=Ref
Barra, 2018 ⁴⁶	CRT-P	Procedure related complications - not specified	1223	Mean: 43.7 months	172(14)	NR	NR	Reference
Barra, 2018 ⁴⁶	CRT-D	Procedure related complications - not specified	1785	Mean: 36.2 months	NR	NR	NR	OR: 1.29, 95% CI: 0.81 to 2.05, p=Ref
Barra, 2018 ⁴⁶	CRT-P	Procedure related complications - not specified	1223	Mean: 43.7 months	NR	NR	NR	Reference
Barra, 2018 ⁴⁶	CRT-D	Procedure related complications - not specified	1618	Mean: 36.2 months	191(11.8)	NR	NR	HR: 1.68, 95% CI: 1.27-2.23, p=0.001
Barra, 2018 ⁴⁶	CRT-P	Procedure related complications - not specified	1136	Mean: 43.7 months	94(8.3)	NR	NR	Reference
Barra, 2018 ⁴⁶	CRT-D	Procedure related complications - not specified	1618	Mean: 36.2 months	191(11.8)	NR	NR	HR: 1.73, 95% CI: 1.11-2.68, p=0.013
Barra, 2018 ⁴⁶	CRT-P	Procedure related complications - not specified	1136	Mean: 43.7 months	94(8.3)	NR	NR	Reference

Table D19: Harms reported in the studies assessing harms of CRT P vs. D (continuous)

Author, Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Doring, 2018 ⁵⁵	CRT-P	Procedure related complications - not specified	80	Mean: 23.5 months	4(5)	NR	NR	NR
Doring, 2018 ⁵⁵	CRT-D	Procedure related complications - not specified	97	Mean: 27.6 months	9(9.3)	NR	NR	NR
Doring, 2018 ⁵⁵	CRT-P	Procedure related complications - not specified	80	Mean: 23.5 months	2(2.5)	NR	NR	NR
Doring, 2018 ⁵⁵	CRT-D	Procedure related complications - not specified	97	Mean: 27.6 months	0(0)	NR	NR	NR
Looi, 2018 ⁸¹	CRT-P	Acute perioperative complications	157	Median: 4 years	NR	9(5.7)	NR	p=0.78
Looi, 2018 ⁸¹	CRT-D	Acute perioperative complications	43	Median: 4 years	NR	2(4.7)	NR	p=0.78
Looi, 2018 ⁸¹	CRT-P	Late complications	157	Median: 4 years	NR	9(5.7)	NR	p=0.4
Looi, 2018 ⁸¹	CRT-D	Late complications	43	Median: 4 years	NR	4(9.3)	NR	p=0.4
Nezorov, 2018 ⁸⁶	Male	Procedure related complications - not specified	144	12 months	8(5.6)	NR	NR	NR
Nezorov, 2018 ⁸⁶	Female	Procedure related complications - not specified	34	12 months	5(14.7)	NR	NR	NR

Table D19: Harms reported in the studies assessing harms of CRT P vs. D (continuous)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Nezorov, 2018 ⁸⁶	Male	Procedure related complications - not specified	144	12 months	1(0.7)	NR	NR	NR
Nezorov, 2018 ⁸⁶	Female	Procedure related complications - not specified	34	12 months	1(2.9)	NR	NR	NR
Nezorov, 2018 ⁸⁶	Male	Procedure related complications - not specified	144	12 months	4(2.8)	NR	NR	NR
Nezorov, 2018 ⁸⁶	Female	Procedure related complications - not specified	34	12 months	0(0)	NR	NR	NR
Length of hospital stay								
Looi, 2018 ⁸¹	Overall (CRT vs CRT-P)	Length of hospital stay Median: 4 (IQR 2) days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-D (>85yrs, Co-Morbidity score >/=3)	Length of hospital stay 10Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	ICD (>85yrs, Co-Morbidity score >/=3)	Length of hospital stay 10Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	ICD (>85yrs, >/= complication)	Length of hospital stay 11Days	NR	NR	NR	NR	NR	NR

Table D19: Harms reported in the studies assessing harms of CRT P vs. D (continuous)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Swindle,2010 ⁹⁹	CRT-P (>85yrs, >/= complication)	Length of hospital stay 13Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-D (19- 79yrs, 0 complication)	Length of hospital stay 2Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-D (19- 79yrs, Co- Morbidity score 0)	Length of hospital stay 2Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-D (80- 85yrs, Co- Morbidity score 0)	Length of hospital stay 2Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-P (19-79yrs, Co-Morbidity score 0)	Length of hospital stay 2Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-P (80-85yrs, Co-Morbidity score 0)	Length of hospital stay 2Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	ICD (19-79yrs, Co-Morbidity score 0)	Length of hospital stay 2Days	NR	NR	NR	NR	NR	NR

Table D19: Harms reported in the studies assessing harms of CRT P vs. D (continuous)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Swindle,2010 ⁹⁹	CRT-D (>85yrs, 0 complication)	Length of hospital stay 3Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-D (>85yrs, Co-Morbidity score 0)	Length of hospital stay 3Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-D (19-79yrs, Co-Morbidity score 1-2)	Length of hospital stay 3Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-D (80-85yrs, 0 complication)	Length of hospital stay 3Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-D (80-85yrs, Co-Morbidity score 1-2)	Length of hospital stay 3Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-P (>85yrs, Co-Morbidity score 0)	Length of hospital stay 3Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-P (19-79yrs, 0 complication)	Length of hospital stay 3Days	NR	NR	NR	NR	NR	NR

Table D19: Harms reported in the studies assessing harms of CRT P vs. D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Swindle,2010 ⁹⁹	CRT-P (19-79yrs, Co-Morbidity score 1-2)	Length of hospital stay 3Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-P (80-85yrs, 0 complication)	Length of hospital stay 3Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	ICD (19-79yrs, 0 complication)	Length of hospital stay 3Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	ICD (19-79yrs, Co-Morbidity score 1-2)	Length of hospital stay 3Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	ICD (80-85yrs, Co-Morbidity score 0)	Length of hospital stay 3Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-P (80-85yrs, Co-Morbidity score 1-2)	Length of hospital stay 4Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	ICD (80-85yrs, 0 complication)	Length of hospital stay 4Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	ICD (>85yrs, Co-Morbidity score 0)	Length of hospital stay 4Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	ICD (80-85yrs, Co-Morbidity score 1-2)	Length of hospital stay 4Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-D (>85yrs, Co-Morbidity score 1-2)	Length of hospital stay 5Days	NR	NR	NR	NR	NR	NR

Table D19: Harms reported in the studies assessing harms of CRT P vs. D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Swindle,2010 ⁹⁹	CRT-P (>85yrs, 0 complication)	Length of hospital stay 5Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-D (19-79yrs, Co-Morbidity score >/=3)	Length of hospital stay 6Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	ICD (>85yrs, 0 complication)	Length of hospital stay 6Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	ICD (19-79yrs, Co-Morbidity score >/=3)	Length of hospital stay 6Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	ICD (>85yrs, Co-Morbidity score 1-2)	Length of hospital stay 6Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-P (>85yrs, Co-Morbidity score 1-2)	Length of hospital stay 7Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-P (19-79yrs, Co-Morbidity score >/=3)	Length of hospital stay 7Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-D (>85yrs, >/= complication)	Length of hospital stay 8Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-D (80-85yrs, >/= complication)	Length of hospital stay 8Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-D (80-85yrs, Co-Morbidity score >/=3)	Length of hospital stay 8Days	NR	NR	NR	NR	NR	NR

Table D19: Harms reported in the studies assessing harms of CRT P vs. D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Swindle,2010 ⁹⁹	CRT-P (>85yrs, Co-Morbidity score >/=3)	Length of hospital stay 8Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-P (80-85yrs, >/= complication)	Length of hospital stay 8Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-P (80-85yrs, Co-Morbidity score >/=3)	Length of hospital stay 8Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	ICD (80-85yrs, Co-Morbidity score >/=3)	Length of hospital stay 8Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-D (19- 79yrs,>/= complication)	Length of hospital stay 9Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	CRT-P (19- 79yrs,>/= complication)	Length of hospital stay 9Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	ICD (19- 79yrs,>/= complication)	Length of hospital stay 9Days	NR	NR	NR	NR	NR	NR
Swindle,2010 ⁹⁹	ICD (80-85yrs, >/= complication)	Length of hospital stay 9Days	NR	NR	NR	NR	NR	NR
Pneumothorax								
Azizi,2006 ⁴⁵	Overall	Pneumothorax	285	Mean 1.7 years (SD 1.3)	NR	2(0.6)	NR	NR
Barra, 2018 ⁴⁶	CRT-D	Pneumothorax	1785	Mean: 36.2 months	9(0.5)	NR	NR	NR
Barra, 2018 ⁴⁶	CRT-P	Pneumothorax	1223	Mean: 43.7 months	11(0.9)	NR	NR	NR

Table D19: Harms reported in the studies assessing harms of CRT P vs. D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Killu,20113 ⁷⁰	≤80	Pneumothorax	632	30 DAYS	8(1.3)	NR	NR	NR
Killu,20113 ⁷⁰	≥80	Pneumothorax	90	30 DAYS	2(2.2)	NR	NR	NR
Killu,20113 ⁷⁰	Overall	Pneumothorax	722	30 DAYS	10(1.4)	NR	NR	NR
Kober, 2016 ⁷²	ICD/CRT-ICD	Pneumothorax	556	median 67.6 months (iqr 49, 85)	11(2)	NR	NR	OR: 1.86, 95% CI: 0.68-5.08, p=0.22
Kober, 2016 ⁷²	Medical therapy/CRT- Pacer	Pneumothorax	560	median 67.6 months (iqr 49, 85)	6(1.1)	NR	NR	NR
Nezorov, 2018 ⁸⁶	Female	Pneumothorax	34	12 months	0(0)	NR	NR	p=Not significant
Nezorov, 2018 ⁸⁶	Male	Pneumothorax	144	12 months	0(0)	NR	NR	p=Not significant
Romeyer- Bouchard,2010 ⁹¹	Overall	Pneumothorax	303	NR	1(0.3)	NR	NR	NR
Verbrugge,2013 ¹⁰⁴	<70 years	Pneumothorax	76	NR	0(0)	NR	NR	NR
Verbrugge,2013 ¹⁰⁴	≥80 years	Pneumothorax	49	NR	0(0)	NR	NR	NR
Verbrugge,2013 ¹⁰⁴	70-79years	Pneumothorax	95	NR	1(1)	NR	NR	NR
Pocket hematoma								
Barra, 2018 ⁴⁶	CRT-D	Pocket hematoma	1785	Mean: 36.2 months	18(1)	NR	NR	NR
Barra, 2018 ⁴⁶	CRT-D	Pocket hematoma	1618	Mean: 36.2 months	1(0.05)	NR	NR	NR
Barra, 2018 ⁴⁶	CRT-P	Pocket hematoma	1223	Mean: 43.7 months	8(0.7)	NR	NR	NR
Barra, 2018 ⁴⁶	CRT-P	Pocket hematoma	1136	Mean: 43.7 months	1(0.08)	NR	NR	NR

Table D19: Harms reported in the studies assessing harms of CRT P vs. D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Doring, 2018 ⁵⁵	CRT-D	Pocket hematoma	97	Mean: 27.6 months	1(1)	NR	NR	NR
Doring, 2018 ⁵⁵	CRT-P	Pocket hematoma	80	Mean: 23.5 months	0(0)	NR	NR	NR
Killu,20113 ⁷⁰	≤80	Pocket hematoma	632	30 DAYS	3(0.5)	NR	NR	NR
Killu,20113 ⁷⁰	≥80	Pocket hematoma	90	30 DAYS	1(1.1)	NR	NR	NR
Killu,20113 ⁷⁰	Overall	Pocket hematoma	722	30 DAYS	4(0.6)	NR	NR	NR
Looi, 2018 ⁸¹	CRT-D	Pocket hematoma	157	Median: 4 years	NR	1(0.6)	NR	NR
Looi, 2018 ⁸¹	CRT-P	Pocket hematoma	43	Median: 4 years	NR	0(0)	NR	NR
Nezorov, 2018 ⁸⁶	Female	Pocket hematoma	34	12 months	0(0)	NR	NR	NR
Nezorov, 2018 ⁸⁶	Male	Pocket hematoma	144	12 months	1(0.7)	NR	NR	NR
Romeyer- Bouchard,2010 ⁹¹	Overall	Pocket hematoma	303	NR	29(9.5)	NR	NR	NR
Device infection								
Azizi,2006 ⁴⁵	Overall	Device Infection	285	Mean 1.7 years (SD 1.3)	NR	2(0.6)	NR	NR
Barra, 2018 ⁴⁶	CRT-D	Device Infection	1785	Mean: 36.2 months	55(3.1)	NR	NR	NR
Barra, 2018 ⁴⁶	CRT-D	Device Infection	1618	Mean: 36.2 months	55(3.4)	NR	NR	NR
Barra, 2018 ⁴⁶	CRT-P	Device Infection	1223	Mean: 43.7 months	24(1.9)	NR	NR	NR
Barra, 2018 ⁴⁶	CRT-P	Device Infection	1136	Mean: 43.7 months	24(2.1)	NR	NR	NR

Table D19: Harms reported in the studies assessing harms of CRT P vs. D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Doring, 2018 ⁵⁵	CRT-D	Device Infection	97	Mean: 27.6 months	3(3.1)	NR	NR	NR
Doring, 2018 ⁵⁵	CRT-P	Device Infection	80	Mean: 23.5 months	0(0)	NR	NR	NR
Killu,2011 ³⁷⁰	≤80	Device Infection	632	30 DAYS	0.3(2)	NR	NR	NR
Killu,2011 ³⁷⁰	≥80	Device Infection	90	30 DAYS	0(0)	NR	NR	NR
Killu,2011 ³⁷⁰	Overall	Device Infection	722	30 DAYS	2(0.3)	NR	NR	NR
Kober, 2016 ⁷²	ICD/CRT-ICD - CRT	Device Infection	322	median 67.6 months (iqr 49, 85)	15(4.7)	NR	NR	OR: 0.83, 95% CI: 0.38-1.78, p=0.6
Kober, 2016 ⁷²	ICD/CRT-ICD - CRT	Device Infection	322	NR	9(2.8)	NR	NR	OR: 0.82, 95% CI: 0.29-2.20, p=0.65
Kober, 2016 ⁷²	ICD/CRT-ICD - NO -CRT	Device Infection	234	median 67.6 months (iqr 49, 85)	12(5.1)	NR	NR	OR: 6.35, 95% CI: 1.38-58.87, p=0.006
Kober, 2016 ⁷²	ICD/CRT-ICD - NO -CRT	Device Infection	234	NR	6(2.6)	NR	NR	OR: 3.09, 95% CI: 0.54-31.56, p=0.24
Kober, 2016 ⁷²	ICD/CRT-ICD total	Device Infection	556	median 67.6 months (iqr 49, 85)	27(4.9)	NR	NR	OR: 1.38, 95% CI: 0.73-2.63, p=0.29
Kober, 2016 ⁷²	ICD/CRT-ICD - total	Device Infection	556	median 67.6 months (iqr 49, 85)	15(2.7)	NR	NR	OR: 1.17, 95% CI: 0.51-2.69, p=0.69
Kober, 2016 ⁷²	Medical therapy/CRT- Pacer	Device Infection	560	NR	13(2.3)	NR	NR	Reference
Kober, 2016 ⁷²	Medical therapy/CRT- Pacer -CRT	Device Infection	323	median 67.6 months (iqr 49, 85)	18(5.6)	NR	NR	Reference

Table D19: Harms reported in the studies assessing harms of CRT P vs. D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Kober, 2016 ⁷²	Medical therapy/CRT- Pacer -CRT	Device Infection	323	NR	11(3.4)	NR	NR	Reference
Kober, 2016 ⁷²	Medical therapy/CRT- Pacer -No CRT	Device Infection	237	median 67.6 months (iqr 49, 85)	2(0.8)	NR	NR	Reference
Kober, 2016 ⁷²	Medical therapy/CRT- Pacer -No CRT	Device Infection	237	NR	2(0.8)	NR	NR	Reference
Kober, 2016 ⁷²	Medical therapy/CRT- Pacer total	Device Infection	560	median 67.6 months (iqr 49, 85)	20(3.6)	NR	NR	Reference
Looi, 2018 ⁸¹	CRT-D	Device Infection	157	Median: 4 years	NR	1(0.6)	NR	p=0.97
Looi, 2018 ⁸¹	CRT-P	Device Infection	43	Median: 4 years	NR	1(2.3)	NR	p=0.97
Nezorov, 2018 ⁸⁶	Female	Device Infection	34	12 months	4(11.8)	NR	NR	NR
Nezorov, 2018 ⁸⁶	Male	Device Infection	144	12 months	4(2.8)	NR	NR	NR
Romeyer- Bouchard,2010 ⁹¹	Overall	Device Infection	303	NR	13(4.3)	NR	NR	NR
Schuchert,2013 ⁴² MASCOT Sub Study	CRT-D	Device Infection	228	12 months	3(1.2)	NR	NR	NR
Schuchert,2013 ⁴² MASCOT Sub Study	CRT-P	Device Infection	174	12 months	2(1.3)	NR	NR	NR

Table D19: Harms reported in the studies assessing harms of CRT P vs. D (continued)

Author, Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Cardiac perforation/tamponade								
Azizi,2006 ⁴⁵	Overall	Cardiac perforation/ tamponade	285	Mean 1.7 years (SD 1.3)	NR	1(0.3)	NR	NR
Bristow,2004 ³⁴ COMPANION	CRT-D	Cardiac Perforation/ Tamponade	595	NR	(0.3)	NR	NR	NR
Bristow,2004 ³⁴ COMPANION	CRT-P	Cardiac Perforation/ Tamponade	617	NR	(0.5)	NR	NR	NR
Bristow,2004 ³⁴ COMPANION	Optimal Pharmacological Therapy	Cardiac Perforation/ Tamponade	308	NR	NR	NR	NR	NR
Barra, 2018 ⁴⁶	CRT-D	Cardiac perforation/ tamponade	1785	Mean: 36.2 months	5(0.3)	NR	NR	NR
Barra, 2018 ⁴⁶	CRT-D	Cardiac perforation/ tamponade	1618	Mean: 36.2 months	2(0.1)	NR	NR	NR
Barra, 2018 ⁴⁶	CRT-P	Cardiac perforation/ tamponade	1223	Mean: 43.7 months	0(0)	NR	NR	NR
Barra, 2018 ⁴⁶	CRT-P	Cardiac perforation/ tamponade	1136	Mean: 43.7 months	0(0)	NR	NR	NR
Killu,20113 ⁷⁰	≤80	Cardiac perforation/ tamponade	632	30 DAYS	1(0.2)	NR	NR	NR
Killu,20113 ⁷⁰	≥80	Cardiac perforation/ tamponade	90	30 DAYS	0(0)	NR	NR	NR

Table D19: Harms reported in the studies assessing harms of CRT P vs. D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Killu,2011 ³⁷⁰	Overall	Cardiac perforation/ tamponade	722	30 DAYS	1(0.1)	NR	NR	NR
Looi, 2018 ⁸¹	CRT-D	Cardiac perforation/ tamponade	157	Median: 4 years	NR	1(0.6)	NR	NR
Looi, 2018 ⁸¹	CRT-P	Cardiac perforation/ tamponade	43	Median: 4 years	NR	0(0)	NR	NR
Verbrugge,2013 ¹⁰⁴	<70 years	Cardiac perforation/ tamponade	76	NR	0(0)	NR	NR	NR
Verbrugge,2013 ¹⁰⁴	>/=80 years	Cardiac perforation/ tamponade	49	NR	0(0)	NR	NR	NR
Verbrugge,2013 ¹⁰⁴	70-79years	Cardiac perforation/ tamponade	95	NR	1(1)	NR	NR	NR

Table D19: Harms reported in the studies assessing harms of CRT P vs. D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Lead dislodgement								
Barra, 2018 ⁴⁶	CRT-D	Lead dislodgement	1785	Mean: 36.2 months	78(4.4)	NR	NR	NR
Barra, 2018 ⁴⁶	CRT-D	Lead dislodgement	1618	Mean: 36.2 months	50(3.1)	NR	NR	NR
Barra, 2018 ⁴⁶	CRT-P	Lead dislodgement	1223	Mean: 43.7 months	51(4.2)	NR	NR	NR
Barra, 2018 ⁴⁶	CRT-P	Lead dislodgement	1136	Mean: 43.7 months	26(2.3)	NR	NR	NR
Doring, 2018 ⁵⁵	CRT-D	Lead dislodgement	97	Mean: 27.6 months	5(5.2)	NR	NR	NR
Doring, 2018 ⁵⁵	CRT-P	Lead dislodgement	80	Mean: 23.5 months	2(2.5)	NR	NR	NR
Looi, 2018 ⁸¹	CRT-D	Lead dislodgement	157	Median: 4 years	NR	7(4.5)	NR	p=0.53
Looi, 2018 ⁸¹	CRT-P	Lead dislodgement	43	Median: 4 years	NR	1(2.3)	NR	p=0.53
Looi, 2018 ⁸¹	CRT-D	Lead dislodgement	157	Median: 4 years	NR	2(1.3)	NR	NR
Looi, 2018 ⁸¹	CRT-P	Lead dislodgement	43	Median: 4 years	NR	0(0)	NR	NR
Looi, 2018 ⁸¹	CRT-D	Lead dislodgement	157	Median: 4 years	NR	7(4.5)	NR	p=0.5
Looi, 2018 ⁸¹	CRT-P	Lead dislodgement	43	Median: 4 years	NR	3(6.9)	NR	p=0.5
Romeyer- Bouchard,2010 ⁹¹	Overall	Lead dislodgement	303	NR	21(6.9)	NR	NR	NR

Table D19: Harms reported in the studies assessing harms of CRT P vs. D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Verbrugge,2013 ¹⁰⁴	<70 years	Lead dislodgement	76	NR	2(3)	NR	NR	NR
Verbrugge,2013 ¹⁰⁴	>/=80 years	Lead dislodgement	49	NR	1(2)	NR	NR	NR
Verbrugge,2013 ¹⁰⁴	70-79years	Lead dislodgement	95	NR	1(1)	NR	NR	NR
Ventricular arrhythmia								
Kober, 2016 ⁷²	ICD/CRT-ICD -	Ventricular arrhythmias	556	median 67.6 months (iqr 49, 85)	26(4.7)	NR	NR	HR: 1.03, 95% CI: 0.59 to 1.79, p=0.91
Kober, 2016 ⁷²	Medical therapy/CRT- Pacer	Ventricular arrhythmias	560	median 67.6 months (iqr 49, 85)	25(4.5)	NR	NR	Reference

Table D19: Harms reported in the studies assessing harms of CRT P vs. D (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Death within a week								
Azizi,2006 ⁴⁵	Overall	Death (within a week)	285	Mean 1.7 years (SD 1.3)	NR	0(0)	NR	NR
Takaya,2013 ¹⁰⁰	Overall	Death (within a week)	40	6 months	0(0)	0(0)	NR	NR
Carson,2005 ³⁶ COMPANION Sub Study	CRT-D	Death within a week	595	NR	105 (17.6)	NR	NR	NR
Carson,2005 ³⁶ COMPANION Sub Study	CRT-P	Death within a week	617	NR	131 (21.2)	NR	NR	NR
Carson,2005 ³⁶ COMPANION Sub Study	Optimal Pharmacological Therapy	Death within a week	308	NR	77 (25.0)	NR	NR	NR
Inappropriate ICD shock								
Kober, 2016 ⁷²	ICD/CRT-ICD	Inappropriate ICD shocks (CRT-D only)	556	median 67.6 months (iqr 49, 85)	33(5.9)	NR	NR	p=cannot be calculated
Kober, 2016 ⁷²	Medical therapy/CRT-Pacer	Inappropriate ICD shocks (CRT-D only)	560	median 67.6 months (iqr 49, 85)	0(0)	NR	NR	p=cannot be calculated
Looi, 2018 ⁸¹	Overall (both arms)	Inappropriate ICD shocks (CRT-D only)	157	Median: 4 years	10(6.4)	NR	NR	NR

Table D19: Harms reported in the studies assessing harms of CRT P vs. D (continued)

Author, Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Nakajima, 2018 ⁸⁵	Intermittent AF	Inappropriate ICD shocks (CRT-D only)	67	1460 days	16(24)	NR	NR	HR: 7.9, 95% CI: 2.5 to 35.0, p=NR
Nakajima, 2018 ⁸⁵	Permanent AF	Inappropriate ICD shocks (CRT-D only)	47	1460 days	1(2)	NR	NR	HR: 0.8, 95% CI: 0.1 to 6.2, p=NR
Nakajima, 2018 ⁸⁵	Sinus Rhythm	Inappropriate ICD shocks (CRT-D only)	113	1460 days	3(3)	NR	NR	Reference
Verbrugge, 2013 ¹⁰³	CRT-D	Inappropriate ICD shocks (CRT-D only)	74	NR	3(4.1)	NR	NR	NR

CRT-P=Cardiac Resynchronization Therapy Paced, CRT-D=Cardiac Resynchronization Therapy with Defibrillator, ICD=Implantable Cardioverter Defibrillator, N=Number, HR=Hazard Ratio, CI=Confidence Interval, OR=Odds Ratio, RD=Risk Difference, P=P value, NA=Not Applicable, LBBB=Left Bundle Branch Block, LVEF=Left Ventricular Ejection Fraction, CABG=Coronary Artery Bypass Graft, CRT=Cardiac Resynchronization Therapy, Biv=Bi-Ventricular, RV=Right Ventricular, IHD=Ischemic Heart Disease, NR=Not Reported, SD=Standard Deviation, NA=Not Applicable

Table D20: Outcomes reported in the trials assessing effectiveness of Alternative CRT Techniques versus Conventional Cardiac Resynchronization Therapy Techniques

Author,Year Trial	Arm(name)	Outcome Units	Baseline N	Baseline Outcome	Timepoint	N at Timepoint	Outcome at Timepoint	Within Arm Comparisons	Between Arm Comparisons
Left ventricular ejection fraction									
Bencardino, 2016 ⁴⁷	Quadripolar	Left ventricular ejection fraction	23	Mean: 25 (SD: 6)	3 months	23	Mean: 36 (SD: 12)	NR	p<0.01
Bencardino, 2016 ⁴⁷	Bipolar	Left ventricular ejection fraction	20	Mean: 27 (SD: 3)	3 months	20	Mean: 32 (SD: 4)	NR	Reference
Left ventricular end systolic volume									
Leclercq, 2019 ⁷⁹	Multi-point pacing	mL	284	Mean: 162.8 (SD: 64.1)	6 months	236	Mean: 155.8 (SD: 66.9)	Percent change from baseline: 3.2 (SD: 19.8)	P=0.71
Leclercq, 2019 ⁷⁹	Biventricular pacing	mL	260	Mean: 159.5 (SD: 65.1)	6 months	231	Mean: 152.9 (SD: 70.2)	Percent change from baseline: 4.0 (SD: 21.3)	Reference

CRT-P=Cardiac Resynchronization Therapy Paced, CRT-D=Cardiac Resynchronization Therapy with Defibrillator, ICD=Implantable Cardioverter Defibrillator, N=Number, HR=Hazard Ratio, CI=Confidence Interval, OR=Odds Ratio, RD=Risk Difference, P=P value, NA=Not Applicable, LBBB=Left Bundle Branch Block, LVEF=Left Ventricular Ejection Fraction, CABG=Coronary Artery Bypass Graft, CRT=Cardiac Resynchronization Therapy, Biv=Bi-Ventricular, RV=Right Ventricular, IHD=Ischemic Heart Disease, NR=Not Reported, SD=Standard Deviation, NA=Not Applicable

Table D21: Outcomes reported in the trials assessing effectiveness of Alternative CRT Techniques versus Conventional Cardiac Resynchronization Therapy Techniques (Hospitalization for heart failure and All-cause mortality)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Hospitalization for heart failure								
Leclercq, 2019 ⁷⁹	Multi-point pacing	Hospitalization due to heart failure	236	6 months	NR	NR	% change from baseline: -21.8% in events per 100 patient years	P=0.8
Leclercq, 2019 ⁷⁹	Biventricular pacing	Hospitalization due to heart failure	231	6 months	NR	NR	% change from baseline: -9.1% in events per 100 patient years	Reference
Sardu, 2017 ⁹²	Quadripolar	Hospitalization due to heart failure	99	360 days	15(15.2)	NR	NR	HR: 0.516 95% CI: 0.279 to 0.955, p=0.035
Sardu, 2017 ⁹²	Bipolar	Hospitalization due to heart failure	96	360 days	24(25)	NR	NR	Reference
All-cause mortality								
Leclercq, 2019 ⁷⁹	Multi-point pacing	All cause mortality	284	6 months	4(1.41)	NR	NR	p=0.99
Leclercq, 2019 ⁷⁹	Biventricular pacing	All cause mortality	260	6 months	6(2.31)	NR	NR	Reference
Sardu, 2017 ⁹²	Quadripolar	All cause mortality	99	360 days	5(5)	NR	NR	HR: 0.415 95% CI: 0.104 to 1.659, p=0.214
Sardu, 2017 ⁹²	Bipolar	All cause mortality	96	360 days	7(7.3)	NR	NR	Reference

CRT-P=Cardiac Resynchronization Therapy Paced, CRT-D=Cardiac Resynchronization Therapy with Defibrillator, ICD=Implantable Cardioverter Defibrillator, N=Number, HR=Hazard Ratio, CI=Confidence Interval, OR=Odds Ratio, RD=Risk Difference, P=P value, NA=Not Applicable, LBBB=Left Bundle Branch Block, LVEF=Left Ventricular Ejection Fraction, CABG=Coronary Artery Bypass Graft, CRT=Cardiac Resynchronization Therapy, Biv=Bi-Ventricular, RV=Right Ventricular, IHD=Ischemic Heart Disease, NR=Not Reported, SD=Standard Deviation, NA=Not Applicable

Table D22: Harms reported in the studies assessing harms of Alternative CRT Techniques versus Conventional Cardiac Resynchronization Therapy Techniques

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Pocket hematoma								
Forleo, 2015 ⁵⁸	Overall	Pocket hematoma	395	6 months	3(0.7)	NR	NR	NR
Lead dislodgement								
Sardu, 2017 ⁹²	Quadripolar	Lead dislodgement	99	360 days	1(1)	NR	NR	HR: 0.112, 95% CI: 0.014 to 0.893, p=0.039
Sardu, 2017 ⁹²	Bipolar	Lead dislodgement	96	360 days	9(9.4)	NR	NR	Reference
Ziacchi, 2018 ¹⁰⁶	Quadripolar	Lead dislodgement	109	14 months	4(2)	NR	NR	NR
Ziacchi, 2018 ¹⁰⁶	Bipolar	Lead dislodgement	121	14 months	3(2.5)	NR	NR	NR
Forleo, 2015 ⁵⁸	CRT-D Quartet	Lead dislodgement	219	6 months	6(2.7)	NR	NR	p=0.16
Forleo, 2015 ⁵⁸	CRT-D Bipolar	Lead dislodgement	176	6 months	10(5.7)	NR	NR	p=0.16
Ventricular arrythmia								
Sardu, 2017 ⁹²	Quadripolar	Ventricular arrhythmias	99	360 days	25(25.2)	NR	NR	p=0.5
Sardu, 2017 ⁹²	Bipolar	Ventricular arrhythmias	96	360 days	26(27.1)	NR	NR	NR
Laish-Farkash, 2018 ⁷⁶	Group 3 (only group abstracted)	Ventricular arrhythmias	5	1 year	1(20)	NR	NR	NR
Death within a week								
Laish-Farkash, 2018 ⁷⁶	Group 3 (only group abstracted)	Death (within a week)	5	on implantation day	1(20)	NR	NR	NR

Table D22: Harms reported in the studies assessing harms of Alternative CRT Techniques versus Conventional Cardiac Resynchronization Therapy Techniques (continued)

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Device infection								
Forleo, 2015 ⁵⁸	CRT-D Quartet	Device Infection	219	6 months	0(0)	NR	NR	p=0.12
Forleo, 2015 ⁵⁸	CRT-D Bipolar	Device Infection	176	6 months	2(1.1)	NR	NR	p=0.12

CRT-P=Cardiac Resynchronization Therapy Paced, CRT-D=Cardiac Resynchronization Therapy with Defibrillator, ICD=Implantable Cardioverter Defibrillator, N=Number, HR=Hazard Ratio, CI=Confidence Interval, OR=Odds Ratio, RD=Risk Difference, P=P value, NA=Not Applicable, LBBB=Left Bundle Branch Block, LVEF=Left Ventricular Ejection Fraction, CABG=Coronary Artery Bypass Graft, CRT=Cardiac Resynchronization Therapy, Biv=Bi-Ventricular, RV=Right Ventricular, IHD=Ischemic Heart Disease, NR=Not Reported, SD=Standard Deviation, NA=Not Applicable

Table D23: Outcomes reported in the trials assessing effectiveness of His bundle pacing or CRT versus RV pacing

Author,Year Trial	Arm(name)	Effectiveness Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
NONE REPORTED								

N=sample size;n=number of participants

Table D24: Harms reported in the studies assessing harms of His bundle pacing or CRT versus RV pacing

Author,Year Trial	Arm(name)	Harms Units	N for analysis	Timepoint(s)	n (%) patients with outcomes	n (%) events with outcomes	Within Arm Comparisons	Between Arm Comparisons
Procedure related complications								
Shan, 2017 ⁹⁴	Right ventricular apical	Procedure related complications	11	Range: 16-55 months	0 (0)	NR	NR	NR
Shan, 2017 ⁹⁴	Biventricular pacing non-responder	Procedure related complications	5	Range: 30-55 months	0 (0)	NR	NR	NR
Lead dislodgement								
Bhatt, 2018 ⁴⁸	His bundle pacing	Lead dislodgment	101	1 month	0 (0)	NR	NR	NR
Shan, 2017 ⁹⁴	Right ventricular apical	Lead dislodgment	11	Range: 16-55 months	0 (0)	NR	NR	NR
Shan, 2017 ⁹⁴	Biventricular pacing non-responder	Lead dislodgment	5	Range: 30-55 months	0 (0)	NR	NR	NR
Pneumothorax								
Bhatt, 2018 ⁴⁸	His bundle pacing	Pneumothorax	101	1 month	1(9.9)	NR	NR	NR

CRT=cardiac resynchronization therapy;N=sample size;n=number of participants;NR=not reported;RV=right ventricular pacing

Reference List

1. Cleland JG, Daubert JC, Erdmann E, et al. The effect of cardiac resynchronization on morbidity and mortality in heart failure. *N Engl J Med.* 2005 2005 Apr 14;352(15):1539-49.
2. Cleland JGF, Daubert J-C, Erdmann E, et al. Longer-term effects of cardiac resynchronization therapy on mortality in heart failure [the CARDiac RESynchronization-Heart Failure (CARE-HF) trial extension phase]. *Eur. Heart J.* 2006 2006;27(16):1928-32.
3. Cleland JG, Freemantle N, Daubert JC, et al. Long-term effect of cardiac resynchronisation in patients reporting mild symptoms of heart failure: a report from the CARE-HF study. *Heart.* 2008 2008 Mar;94(3):278-83.
4. Cleland JG, Calvert MJ, Verboven Y, et al. Effects of cardiac resynchronization therapy on long-term quality of life: an analysis from the CARDiac Resynchronisation-Heart Failure (CARE-HF) study. *Am Heart J.* 2009 2009 Mar;157(3):457-66.
5. Cleland JG, Freemantle N, Erdmann E, et al. Long-term mortality with cardiac resynchronization therapy in the Cardiac Resynchronization-Heart Failure (CARE-HF) trial. *Eur J Heart Fail.* 2012 2012 Jun;14(6):628-34.
6. Ghio S, Freemantle N, Scelsi L, et al. Long-term left ventricular reverse remodelling with cardiac resynchronization therapy: results from the CARE-HF trial. *Eur J Heart Fail.* 2009 2009 May;11(5):480-8.
7. Gras D, Bocker D, Lunati M, et al. Implantation of cardiac resynchronization therapy systems in the CARE-HF trial: procedural success rate and safety. *Europace.* 2007 2007 Jul;9(7):516-22.
8. Wikstrom G, Blomstrom-Lundqvist C, Andren B, et al. The effects of aetiology on outcome in patients treated with cardiac resynchronization therapy in the CARE-HF trial. *Eur Heart J.* 2009 2009 Apr;30(7):782-8.
9. Moss AJ, Hall WJ, Cannom DS, et al. Cardiac-resynchronization therapy for the prevention of heart-failure events. *N Engl J Med.* 2009 2009 Oct 1;361(14):1329-38.
10. Arshad A, Moss AJ, Foster E, et al. Cardiac resynchronization therapy is more effective in women than in men: the MADIT-CRT (Multicenter Automatic Defibrillator Implantation Trial with Cardiac Resynchronization Therapy) trial. *J Am Coll Cardiol.* 2011 2011 Feb 15;57(7):813-20.
11. Barsheshet A, Goldenberg I, Moss AJ, et al. Response to preventive cardiac resynchronization therapy in patients with ischaemic and nonischaemic cardiomyopathy in MADIT-CRT. *Eur Heart J.* 2011 2011 Jul;32(13):1622-30.
12. Biton Y, Zareba W, Goldenberg I, et al. Sex Differences in Long-Term Outcomes With Cardiac Resynchronization Therapy in Mild Heart Failure Patients With Left Bundle Branch Block. *J Am Heart Assoc.* 2015 Jun 29;4(7)doi: 10.1161/jaha.115.002013. PMID: 26124205.
13. Biton Y, Kutiyafa V, Cygankiewicz I, et al. Relation of QRS Duration to Clinical Benefit of Cardiac Resynchronization Therapy in Mild Heart Failure Patients Without Left Bundle Branch Block: The Multicenter Automatic Defibrillator Implantation Trial with Cardiac Resynchronization Therapy Substudy. *Circ Heart Fail.* 2016 Feb;9(2):e002667. doi: 10.1161/circheartfailure.115.002667. PMID: 26823498.
14. Biton Y, Ng CY, Xia X, et al. Baseline adverse electrical remodeling and the risk for ventricular arrhythmia in Cardiac Resynchronization Therapy Recipients (MADIT CRT). *J*

- Cardiovasc Electrophysiol. 2018 Jul;29(7):1017-23. doi: 10.1111/jce.13640. PMID: 29846992.
15. Goldenberg I, Kutyifa V, Klein HU, et al. Survival with cardiac-resynchronization therapy in mild heart failure. *New England Journal of Medicine*. 2014;370(18):1694-701. doi: 10.1056/NEJMoa1401426.
 16. Hsu JC, Solomon SD, Bourgoun M, et al. Predictors of super-response to cardiac resynchronization therapy and associated improvement in clinical outcome: the MADIT-CRT (multicenter automatic defibrillator implantation trial with cardiac resynchronization therapy) study. *J Am Coll Cardiol*. 2012 2012 Jun 19;59(25):2366-73.
 17. Jamerson D, McNitt S, Polonsky S, et al. Early Procedure-Related Adverse Events by Gender in MADIT-CRT. *J Cardiovasc Electrophysiol*. 2014 2014 Sep;25(9):985-9.
 18. Ouellet G, Huang DT, Moss AJ, et al. Effect of cardiac resynchronization therapy on the risk of first and recurrent ventricular tachyarrhythmic events in MADIT-CRT. *J Am Coll Cardiol*. 2012 2012 Oct 30;60(18):1809-16.
 19. Ruwald MH, Solomon SD, Foster E, et al. Left ventricular ejection fraction normalization in cardiac resynchronization therapy and risk of ventricular arrhythmias and clinical outcomes: results from the Multicenter Automatic Defibrillator Implantation Trial With Cardiac Resynchronization Therapy (MADIT-CRT) trial. *Circulation*. 2014 Dec 23;130(25):2278-86. doi: 10.1161/circulationaha.114.011283. PMID: 25301831.
 20. Sabbag A, Goldenberg I, Moss AJ, et al. Predictors and Risk of Ventricular Tachyarrhythmias or Death in Black and White Cardiac Patients: A MADIT-CRT Trial Substudy. *JACC Clin Electrophysiol*. 2016 Aug;2(4):448-55. doi: 10.1016/j.jacep.2016.03.003. PMID: 29759864.
 21. Solomon SD, Foster E, Bourgoun M, et al. Effect of cardiac resynchronization therapy on reverse remodeling and relation to outcome: multicenter automatic defibrillator implantation trial: cardiac resynchronization therapy. *Circulation*. 2010 2010 Sep 7;122(10):985-92.
 22. Stockburger M, Moss AJ, Klein HU, et al. Sustained clinical benefit of cardiac resynchronization therapy in non-LBBB patients with prolonged PR-interval: MADIT-CRT long-term follow-up. *Clin Res Cardiol*. 2016 Nov;105(11):944-52. doi: 10.1007/s00392-016-1003-z. PMID: 27318807.
 23. Tompkins C, Kutyifa V, McNitt S, et al. Effect on cardiac function of cardiac resynchronization therapy in patients with right bundle branch block (from the Multicenter Automatic Defibrillator Implantation Trial With Cardiac Resynchronization Therapy. *Am J Cardiol*. 2013 2013 Aug 15;112(4):525-9.
 24. Zareba W, Klein H, Cygankiewicz I, et al. Effectiveness of Cardiac Resynchronization Therapy by QRS Morphology in the Multicenter Automatic Defibrillator Implantation Trial-Cardiac Resynchronization Therapy (MADIT-CRT). *Circulation*. 2011 2011 Mar 15;123(10):1061-72.
 25. Tang AS, Wells GA, Talajic M, et al. Cardiac-resynchronization therapy for mild-to-moderate heart failure. *N Engl J Med*. 2010 2010 Dec 16;363(25):2385-95.
 26. Birnie DH, Ha A, Higginson L, et al. Impact of QRS morphology and duration on outcomes after cardiac resynchronization therapy: Results from the Resynchronization-Defibrillation for Ambulatory Heart Failure Trial (RAFT). *Circ Heart Fail*. 2013 2013 Nov;6(6):1190-8.
 27. Essebag V, Joza J, Birnie DH, et al. Incidence, predictors, and procedural results of upgrade to resynchronization therapy: the RAFT upgrade substudy. *Circ Arrhythm Electrophysiol*. 2015 Feb;8(1):152-8. doi: 10.1161/circep.114.001997. PMID: 25417892.
 28. Gillis AM, Kerr CR, Philippon F, et al. Impact of Cardiac Resynchronization Therapy on Hospitalizations in the

- Resynchronization-Defibrillation for Ambulatory Heart Failure Trial. *Circulation*. 2014 2014 Mar 7.
29. Healey JS, Hohnloser SH, Exner DV, et al. Cardiac resynchronization therapy in patients with permanent atrial fibrillation: results from the Resynchronization for Ambulatory Heart Failure Trial (RAFT). *Circ Heart Fail*. 2012 2012 Sep 1;5(5):566-70.
 30. Sapp JL, Parkash R, Wells GA, et al. Cardiac Resynchronization Therapy Reduces Ventricular Arrhythmias in Primary but Not Secondary Prophylactic Implantable Cardioverter Defibrillator Patients: Insight From the Resynchronization in Ambulatory Heart Failure Trial. *Circ Arrhythm Electrophysiol*. 2017 Mar;10(3)doi: 10.1161/circep.116.004875. PMID: 28292754.
 31. Young JB, Abraham WT, Smith AL, et al. Combined cardiac resynchronization and implantable cardioversion defibrillation in advanced chronic heart failure: the MIRACLE ICD Trial. *JAMA*. 2003 2003 May 28;289(20):2685-94.
 32. Abraham WT, Fisher WG, Smith AL, et al. Cardiac resynchronization in chronic heart failure. *N Engl J Med*. 2002 2002 Jun 13;346(24):1845-53.
 33. St John Sutton MG, Plappert T, Abraham WT, et al. Effect of cardiac resynchronization therapy on left ventricular size and function in chronic heart failure. *Circulation*. 2003 2003 Apr 22;107(15):1985-90.
 34. Bristow MR, Saxon LA, Boehmer J, et al. Cardiac-resynchronization therapy with or without an implantable defibrillator in advanced chronic heart failure. *N Engl J Med*. 2004 2004 May 20;350(21):2140-50.
 35. Anand IS, Carson P, Galle E, et al. Cardiac resynchronization therapy reduces the risk of hospitalizations in patients with advanced heart failure: results from the Comparison of Medical Therapy, Pacing and Defibrillation in Heart Failure (COMPANION) trial. *Circulation*. 2009 2009 Feb 24;119(7):969-77.
 36. Carson P, Anand I, O'Connor C, et al. Mode of death in advanced heart failure: the Comparison of Medical, Pacing, and Defibrillation Therapies in Heart Failure (COMPANION) trial. *J Am Coll Cardiol*. 2005 2005 Dec 20;46(12):2329-34.
 37. Kalscheur MM, Saxon LA, Lee BK, et al. Outcomes of cardiac resynchronization therapy in patients with intermittent atrial fibrillation or atrial flutter in the COMPANION trial. *Heart Rhythm*. 2017 Jun;14(6):858-65. doi: 10.1016/j.hrthm.2017.03.024. PMID: 28323173.
 38. Shamoun F, De Marco T, DeMets D, et al. Impact of Degree of Left Ventricular Remodeling on Clinical Outcomes From Cardiac Resynchronization Therapy. *JACC: Heart Failure*. 2019;7(4):281-90. doi: 10.1016/j.jchf.2018.11.004.
 39. Cazeau S, Leclercq C, Lavergne T, et al. Effects of multisite biventricular pacing in patients with heart failure and intraventricular conduction delay. *N Engl J Med*. 2001 2001 Mar 22;344(12):873-80.
 40. Leclercq C, Walker S, Linde C, et al. Comparative effects of permanent biventricular and right-univentricular pacing in heart failure patients with chronic atrial fibrillation. *Eur Heart J*. 2002 2002 Nov;23(22):1780-7.
 41. Abraham WT, Young JB, Leon AR, et al. Effects of cardiac resynchronization on disease progression in patients with left ventricular systolic dysfunction, an indication for an implantable cardioverter-defibrillator, and mildly symptomatic chronic heart failure. *Circulation*. 2004 2004 Nov 2;110(18):2864-8.
 42. Schuchert A, Muto C, Maounis T, et al. Lead complications, device infections, and clinical outcomes in the first year after implantation of cardiac resynchronization therapy-defibrillator and cardiac resynchronization therapy-pacemaker. *Europace*. 2013 2013 Jan;15(1):71-6.

43. Adelstein EC, Liu J, Jain S, et al. Clinical outcomes in cardiac resynchronization therapy-defibrillator recipients 80 years of age and older. *Europace*. 2016 Mar;18(3):420-7. doi: 10.1093/europace/euv222. PMID: 26487669.
44. Auricchio A, Gold MR, Brugada J, et al. Long-term effectiveness of the combined minute ventilation and patient activity sensors as predictor of heart failure events in patients treated with cardiac resynchronization therapy: Results of the Clinical Evaluation of the Physiological Diagnosis Function in the PARADYM CRT device Trial (CLEPSYDRA) study. *Eur J Heart Fail*. 2014;16(6):663-70. doi: 10.1002/ejhf.79.
45. Azizi M, Castel MA, Behrens S, et al. Experience with coronary sinus lead implantations for cardiac resynchronization therapy in 244 patients. *Herzschrittmacherther Elektrophysiol*. 2006 2006 Mar;17(1):13-8.
46. Barra S, Providencia R, Boveda S, et al. Device complications with addition of defibrillation to cardiac resynchronisation therapy for primary prevention. *Heart*. 2018 Sep;104(18):1529-35. doi: 10.1136/heartjnl-2017-312546. PMID: 29540431.
47. Bencardino G, Di Monaco A, Russo E, et al. Outcome of Patients Treated by Cardiac Resynchronization Therapy Using a Quadripolar Left Ventricular Lead. *Circ J*. 2016;80(3):613-8. doi: 10.1253/circj.CJ-15-0932. PMID: 26821688.
48. Bhatt AG, Musat DL, Milstein N, et al. The Efficacy of His Bundle Pacing: Lessons Learned From Implementation for the First Time at an Experienced Electrophysiology Center. *JACC Clin Electrophysiol*. 2018 Nov;4(11):1397-406. doi: 10.1016/j.jacep.2018.07.013. PMID: 30466843.
49. Bossard M, Sticherling C, Kuhne M, et al. Outcome of patients with cardiac resynchronisation defibrillator therapy and a follow-up of at least five years after implant. *Swiss Med Wkly*. 2014 2014;144:w13938.
50. Boven NV, Theuns D, Bogaard K, et al. Atrial Fibrillation in Cardiac Resynchronization Therapy with a Defibrillator: A Risk Factor for Mortality, Appropriate and Inappropriate Shocks. *J Cardiovasc Electrophysiol*. 2013 2013 Jun 17.
51. Van Boven N, Bogaard K, Ruiters J, et al. Functional response to cardiac resynchronization therapy is associated with improved clinical outcome and absence of appropriate shocks. *J Cardiovasc Electrophysiol*. 2013 2013 Mar;24(3):316-22.
52. de Cock CC, van Campen CM, Visser CA. Major dissection of the coronary sinus and its tributaries during lead implantation for biventricular stimulation: angiographic follow-up. *Europace*. 2004 2004 Jan;6(1):43-7.
53. Crossley GH, Biffi M, Johnson B, et al. Performance of a novel left ventricular lead with short bipolar spacing for cardiac resynchronization therapy: primary results of the Attain Performa quadripolar left ventricular lead study. *Heart Rhythm*. 2015 Apr;12(4):751-8. doi: 10.1016/j.hrthm.2014.12.019. PMID: 25533587.
54. Diab IG, Hunter RJ, Kamdar R, et al. Does ventricular dyssynchrony on echocardiography predict response to cardiac resynchronisation therapy? A randomised controlled study. *Heart*. 2011 2011 Sep;97(17):1410-6.
55. Doring M, Ebert M, Dages N, et al. Cardiac resynchronization therapy in the ageing population - With or without an implantable defibrillator? *Int J Cardiol*. 2018 Jul 15;263:48-53. doi: 10.1016/j.ijcard.2018.03.087. PMID: 29754922.
56. Duray GZ, Israel CW, Pajitnev D, et al. Upgrading to biventricular pacing/defibrillation systems in right ventricular paced congestive heart failure patients: prospective assessment of procedural parameters and response rate. *Europace*. 2008 2008 Jan;10(1):48-52.
57. Echouffo-Tcheugui JB, Masoudi FA, Bao H, et al. Diabetes Mellitus and Outcomes of Cardiac Resynchronization With

- Implantable Cardioverter-Defibrillator Therapy in Older Patients With Heart Failure. *Circ Arrhythm Electrophysiol.* 2016 Aug;9(8)doi: 10.1161/circep.116.004132. PMID: 27489243.
58. Forleo GB, Di Biase L, Panattoni G, et al. Improved implant and postoperative lead performance in CRT-D patients implanted with a quadripolar left ventricular lead. A 6-month follow-up analysis from a multicenter prospective comparative study. *J Interv Card Electrophysiol.* 2015 Jan;42(1):59-66. doi: 10.1007/s10840-014-9956-1. PMID: 25504267.
 59. Friedman DJ, Singh JP, Curtis JP, et al. Comparative Effectiveness of CRT-D Versus Defibrillator Alone in HF Patients With Moderate-to-Severe Chronic Kidney Disease. *J Am Coll Cardiol.* 2015 Dec 15;66(23):2618-29. doi: 10.1016/j.jacc.2015.09.097. PMID: 26670062.
 60. Garikipati NV, Mittal S, Chaudhry F, et al. Comparison of endovascular versus epicardial lead placement for resynchronization therapy. *Am J Cardiol.* 2014 2014 Mar 1;113(5):840-4.
 61. Gasparini M, Menozzi C, Proclemer A, et al. A simplified biventricular defibrillator with fixed long detection intervals reduces implantable cardioverter defibrillator (ICD) interventions and heart failure hospitalizations in patients with non-ischaemic cardiomyopathy implanted for primary prevention: the RELEVANT. *Eur Heart J.* 2009 2009 Nov;30(22):2758-67.
 62. Gopalamurugan AB, Ganesha Babu G, Rogers DP, et al. Is CRT pro-arrhythmic? A comparative analysis of the occurrence of ventricular arrhythmias between patients implanted with CRTs and ICDs. *Front Physiol.* 2014 2014;5:334.
 63. Gras D, Leclercq C, Tang AS, et al. Cardiac resynchronization therapy in advanced heart failure the multicenter InSync clinical study. *Eur J Heart Fail.* 2002 2002 Jun;4(3):311-20.
 64. Haugaa KH, Marek JJ, Ahmed M, et al. Mechanical dyssynchrony after cardiac resynchronization therapy for severely symptomatic heart failure is associated with risk for ventricular arrhythmias. *J Am Soc Echocardiogr.* 2014 2014 Aug;27(8):872-9.
 65. Higgins SL, Hummel JD, Niazi IK, et al. Cardiac resynchronization therapy for the treatment of heart failure in patients with intraventricular conduction delay and malignant ventricular tachyarrhythmias. *J Am Coll Cardiol.* 2003 2003 Oct 15;42(8):1454-9.
 66. Hoke U, Putter H, Van Der Velde ET, et al. Left ventricular reverse remodeling, device-related adverse events, and long-term outcome after cardiac resynchronization therapy in the elderly. *Circ Cardiovasc Qual Outcomes.* 2014 May;7(3):437-44. doi: 10.1161/circoutcomes.113.000821. PMID: 24823954.
 67. Niu HX, Hua W, Wang FZ, et al. Complications of cardiac resynchronization therapy in patients with congestive heart failure. *Chin Med J (Engl).* 2006 2006 Mar 20;119(6):449-53.
 68. Khazanie P, Greiner MA, Al-Khatib SM, et al. Comparative Effectiveness of Cardiac Resynchronization Therapy Among Patients With Heart Failure and Atrial Fibrillation: Findings From the National Cardiovascular Data Registry's Implantable Cardioverter-Defibrillator Registry. *Circ Heart Fail.* 2016 Jun;9(6)doi: 10.1161/circheartfailure.115.002324. PMID: 27296396.
 69. Killu AM, Mazo A, Grupper A, et al. Super-response to cardiac resynchronization therapy reduces appropriate implantable cardioverter defibrillator therapy. *Europace.* 2017 Aug 4doi: 10.1093/europace/eux235. PMID: 29016821.
 70. Killu AM, Wu JH, Friedman PA, et al. Outcomes of cardiac resynchronization therapy in the elderly. *Pacing Clin Electrophysiol.* 2013 2013 Jun;36(6):664-72.
 71. Knight BP, Desai A, Coman J, et al. Long-term retention of cardiac resynchronization therapy. *J Am Coll Cardiol.* 2004 2004 Jul 7;44(1):72-7.

72. Kober L, Thune JJ, Nielsen JC, et al. Defibrillator Implantation in Patients with Nonischemic Systolic Heart Failure. *N Engl J Med*. 2016 Sep 29;375(13):1221-30. doi: 10.1056/NEJMoa1608029. PMID: 27571011.
73. Krahn AD, Snell L, Yee R, et al. Biventricular pacing improves quality of life and exercise tolerance in patients with heart failure and intraventricular conduction delay. *Can J Cardiol*. 2002 2002 Apr;18(4):380-7.
74. Kronborg MB, Johansen JB, Haarbo J, et al. Association between implantable cardioverter-defibrillator therapy and different lead positions in patients with cardiac resynchronization therapy. *Europace*. 2018 Sep 1;20(9):e133-e9. doi: 10.1093/europace/eux296. PMID: 29036292.
75. Kuhlkamp V. Initial experience with an implantable cardioverter-defibrillator incorporating cardiac resynchronization therapy. *J Am Coll Cardiol*. 2002 2002 Mar 6;39(5):790-7.
76. Laish-Farkash A, Bruoha S, Khalameizer V, et al. Multisite cardiac resynchronization therapy for traditional and non-traditional indications. *J Interv Card Electrophysiol*. 2018 Mar;51(2):143-52. doi: 10.1007/s10840-018-0316-4. PMID: 29442199.
77. Landolina M, Gasparini M, Lunati M, et al. Long-term complications related to biventricular defibrillator implantation: rate of surgical revisions and impact on survival: insights from the Italian Clinical Service Database. *Circulation*. 2011 2011 Jun 7;123(22):2526-35.
78. Leclercq C, Cazeau S, Lellouche D, et al. Upgrading from single chamber right ventricular to biventricular pacing in permanently paced patients with worsening heart failure: The RD-CHF Study. *Pacing Clin Electrophysiol*. 2007 2007 Jan;30 Suppl 1:S23-30.
79. Leclercq C, Burri H, Curnis A, et al. Cardiac resynchronization therapy non-responder to responder conversion rate in the more response to cardiac resynchronization therapy with MultiPoint Pacing (MORE-CRT MPP) study: results from Phase I. *Eur Heart J*. 2019 Mar 11doi: 10.1093/eurheartj/ehz109. PMID: 30859220.
80. Looi KL, Sidhu K, Cooper L, et al. Long-term outcomes of heart failure patients who received primary prevention implantable cardioverter-defibrillator: An observational study. *J Arrhythm*. 2018 Feb;34(1):46-54. doi: 10.1002/joa3.12027. PMID: 29721113.
81. Looi KL, Gavin A, Sidhu K, et al. Utilization of cardiac resynchronization therapy in patients with heart failure in the Northern Region of New Zealand. *J Arrhythm*. 2018((Looi K.-L., khanglil@adhb.govt.nz; Sidhu K.; Cooper L.; Lever N.) Green Lane Cardiovascular Service, Auckland City Hospital, Auckland, New Zealand)doi: 10.1002/joa3.12134.
82. Lozano I, Bocchiardo M, Achtelik M, et al. Impact of biventricular pacing on mortality in a randomized crossover study of patients with heart failure and ventricular arrhythmias. *Pacing Clin Electrophysiol*. 2000 2000 Nov;23(11 Pt 2):1711-2.
83. Masoudi FA, Mi X, Curtis LH, et al. Comparative effectiveness of cardiac resynchronization therapy with an implantable cardioverter-defibrillator versus defibrillator therapy alone: a cohort study. *Ann Intern Med*. 2014 2014 May 6;160(9):603-11.
84. Mortensen PT, Sogaard P, Mansour H, et al. Sequential biventricular pacing: evaluation of safety and efficacy. *Pacing Clin Electrophysiol*. 2004 2004 Mar;27(3):339-45.
85. Nakajima I, Noda T, Kanzaski H, et al. Development of Heart Failure From Transient Atrial Fibrillation Attacks in Responders to Cardiac Resynchronization Therapy. *JACC Clin Electrophysiol*. 2018 Sep;4(9):1227-34. doi: 10.1016/j.jacep.2018.06.010. PMID: 30236398.
86. Nevzorov R, Porter A, Mostov S, et al. Gender-Related Differences in Outcomes of Patients with Cardiac Resynchronization Therapy. *Isr Med Assoc J*. 2018 May;5(20):311-5. PMID: 29761679.

87. Luo NS, Yuan WL, Lin YQ, et al. Potential proarrhythmic effect of cardiac resynchronization therapy during perioperative period: data from a single cardiac center. *Chin Med J (Engl)*. 2010 2010 Sep;123(17):2295-8.
88. Pinter A, Mangat I, Korley V, et al. Assessment of resynchronization therapy on functional status and quality of life in patients requiring an implantable defibrillator. *Pacing Clin Electrophysiol*. 2009 2009 Dec;32(12):1509-19.
89. Ricci RP, Pignalberi C, Landolina M, et al. Ventricular rate monitoring as a tool to predict and prevent atrial fibrillation-related inappropriate shocks in heart failure patients treated with cardiac resynchronisation therapy defibrillators. *Heart*. 2014 2014 Jun;100(11):848-54.
90. Rickard J, Cheng A, Spragg D, et al. QRS narrowing is associated with reverse remodeling in patients with chronic right ventricular pacing upgraded to cardiac resynchronization therapy. *Heart Rhythm*. 2013 2013 Jan;10(1):55-60.
91. Romeyer-Bouchard C, Da Costa A, Dauphinot V, et al. Prevalence and risk factors related to infections of cardiac resynchronization therapy devices. *Eur Heart J*. 2010 2010 Jan;31(2):203-10.
92. Sardu C, Barbieri M, Santamaria M, et al. Multipolar pacing by cardiac resynchronization therapy with a defibrillators treatment in type 2 diabetes mellitus failing heart patients: impact on responders rate, and clinical outcomes. *Cardiovasc Diabetol*. 2017 Jun 9;16(1):75. doi: 10.1186/s12933-017-0554-2. PMID: 28599667.
93. Sardu C, Santamaria M, Funaro S, et al. Cardiac electrophysiological alterations and clinical response in cardiac resynchronization therapy with a defibrillator treated patients affected by metabolic syndrome. *Medicine (Baltimore)*. 2017 Apr;96(14):e6558. doi: 10.1097/md.0000000000006558. PMID: 28383431.
94. Shan P, Su L, Zhou X, et al. Beneficial effects of upgrading to His bundle pacing in chronically paced patients with left ventricular ejection fraction <50. *Heart Rhythm*. 2018 Mar;15(3):405-12. doi: 10.1016/j.hrthm.2017.10.031. PMID: 29081396.
95. Stahlberg M, Braunschweig F, Gadler F, et al. Three year outcome of cardiac resynchronization therapy: a single center evaluation. *Pacing Clin Electrophysiol*. 2005 2005 Oct;28(10):1013-7.
96. Steffel J, Robertson M, Singh JP, et al. The effect of QRS duration on cardiac resynchronization therapy in patients with a narrow QRS complex: a subgroup analysis of the EchoCRT trial. *Eur Heart J*. 2015 Aug 7;36(30):1983-9. doi: 10.1093/eurheartj/ehv242. PMID: 26009595.
97. Strimel W, Koplik S, Chen HR, et al. Safety and effectiveness of primary prevention cardioverter defibrillators in octogenarians. *Pacing Clin Electrophysiol*. 2011 2011 Jul;34(7):900-6.
98. Su H, Bao P, Chen KY, et al. Influence of the Right Ventricular Lead Location on Ventricular Arrhythmias in Cardiac Resynchronization Therapy. *Chin Med J (Engl)*. 2018;131(20):2402-9. doi: 10.4103/0366-6999.243560.
99. Swindle JP, Rich MW, McCann P, et al. Implantable cardiac device procedures in older patients: use and in-hospital outcomes. *Arch Intern Med*. 2010 2010 Apr 12;170(7):631-7.
100. Takaya Y, Noda T, Nakajima I, et al. Electrocardiographic predictors of response to cardiac resynchronization therapy in patients with intraventricular conduction delay. *Circ J*. 2014 2014;78(1):71-7.
101. Theuns DA, Thornton AS, Klootwijk AP, et al. Outcome in patients with an ICD incorporating cardiac resynchronisation therapy: differences between primary and secondary prophylaxis. *Eur J Heart Fail*. 2005 2005 Oct;7(6):1027-32.

102. Vado A, Menardi E, Rossetti G, et al. Single-center experience of a quadripolar pacing lead for cardiac resynchronization therapy. *J Interv Card Electrophysiol.* 2014 2014 Mar;39(2):161-5. doi: 10.1038/s41598-018-31692-z. PMID: 30185834.
103. Verbrugge FH, De Vusser P, Rivero-Ayerza M, et al. Cardiac resynchronization therapy with or without defibrillator: experience from a high-volume Belgian implantation centre. *Acta Cardiol.* 2013 2013 Feb;68(1):37-45.
104. Verbrugge FH, Dupont M, De Vusser P, et al. Response to cardiac resynchronization therapy in elderly patients ((greater-than or equal to)70 years) and octogenarians. *Eur. J. Heart Fail.* 2013 2013;15(2):203-10.
105. Ziacchi M, Diemberger I, Corzani A, et al. Cardiac resynchronization therapy: a comparison among left ventricular bipolar, quadripolar and active fixation leads. *Sci Rep.* 2018 Sep 5;8(1):13262. doi: 10.1038/s41598-018-31692-z. PMID: 30185834.
106. Ziacchi M, Zucchelli G, Ricciardi D, et al. Performance and clinical comparison between left ventricular quadripolar and bipolar leads in CRT: Observational research. *Indian Heart J.* 2018((Ziacchi M., matteo.ziacchi@gmail.com; Boriani G.; Biffi M.) Istituto di Cardiologia, Policlinico S. Orsola-Malpighi, Università di Bologna, Bologna, Italy)doi: 10.1016/j.ihj.2018.05.007.
107. Xue C, Hua W, Cai C, et al. Acute and Chronic Changes and Predictive Value of Tpeak-Tend for Ventricular Arrhythmia Risk in Cardiac Resynchronization Therapy Patients. *Chin Med J (Engl).* 2016 Sep 20;129(18):2204-11. doi: 10.4103/0366-6999.189916. PMID: 27625093.