

Specifications

Descriptive Information

De.1. Measure Type *(Patient-reported outcomes include HRQoL/functional status, symptom/burden, experience with care, health-related behavior.)**

Process

De.2. Measure Title*

Compliance with Spontaneous Breathing Trial (SBT) (including Tracheostomy Collar Trial (TCT) or Continuous Positive Airway Pressure (CPAP) Breathing Trial) by Day 2 of the LTCH Stay

De.3. Brief description of measure *(including type of score, measure focus, target population, timeframe, e.g., Percentage of adult patients aged 18-75 years receiving one or more HbA1c tests per year)*

This measure assesses facility-level compliance with Spontaneous Breathing Trial (SBT), including Tracheostomy Collar Trial (TCT) or Continuous Positive Airway Pressure (CPAP) breathing trial, by Day 2 of the Long-Term Care Hospital (LTCH) stay for patients on invasive mechanical ventilation support upon admission, *and* for whom at admission weaning attempts were expected or anticipated. This measure is calculated and reported for the following two categories:

- (1) Component 1: the percentage of patients who were assessed for readiness for SBT (including TCT or CPAP breathing trial) by Day 2 of the LTCH stay, (“Percentage of Patients Assessed for Readiness for SBT by Day 2 of LTCH Stay”).
- (2) Component 2: the percentage of patients found ready for SBT (including TCT or CPAP breathing trial) for whom an SBT (including TCT or CPAP breathing trial) was performed by Day 2 of LTCH stay. (“Percentage of Patients Ready for SBT Who Received SBT by Day 2 of LTCH Stay”).

Component 2 is a subset of the population in 1. While all patients admitted on invasive mechanical ventilation are included in the denominator for 1, only those patients who were found ready for SBT (including TCT and CPAP breathing trial) are included in the denominator for 2. Data will be collected using items to be added to the Long-Term Care Hospital Continuity Assessment Record and Evaluation Data Set (LTCH CARE Data Set).

Definitions:

- (a) For the purpose of this measure, invasive mechanical ventilation support is defined as the use of a device to assist or control pulmonary ventilation, inclusive of the weaning period, either intermittently or continuously through a tracheostomy or by endotracheal intubation.

Note: Lung expansion devices such as intermittent positive-pressure breathing (IPPB); nasal positive end-expiratory pressure (nasal PEEP); and continuous nasal positive airway pressure (CPAP, hypoCPAP) are not considered ventilators unless delivered via tracheostomy or endotracheal intubation (e.g., ET-CPAP).

- (b) For the purpose of this measure, Day 2 of the LTCH stay is defined as the second day of the patient’s LTCH stay, where Day 1 is the day of admission.
- (c) For the purpose of this measure, “weaning” patients are those patients on invasive mechanical ventilation upon admission to the LTCH, for whom at admission weaning attempts are expected or anticipated. Please refer to the definition of “weaning” in the LTCH Quality Reporting Program (QRP) Manual for additional information and examples. (<https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/LTCH-Quality-Reporting/LTCH-CARE-Data-Set-and-LTCH-QRP-Manual.html>).

- (d) For the purpose of this measure, “non-weaning” patients are those patients on invasive mechanical ventilation upon admission to the LTCH, for whom at admission weaning attempts are NOT expected or anticipated (e.g., patients who are chronically ventilated in the community or a facility, or have progressive neuromuscular disease such as amyotrophic lateral sclerosis, or irreversible neurological injury or disease or dysfunction such as high (C2) spinal cord injury). Consideration of a patient as non-weaning *must* be based on documentation found in the patient’s medical record at admission. Please refer to the LTCH QRP Manual for additional information.
- (e) For the purpose of this measure, SBT is a trial of unassisted breathing for a certain period of time during the day and full ventilator support at night, administered to patients with endotracheal tubes. This includes TCT or CPAP breathing trial.
- (f) For the purpose of this measure, TCT is a trial of unassisted breathing via a tracheostomy collar (mask) with aerosol (mist), administered to patients with tracheostomy tubes. TCT would apply only to patients with tracheostomy tubes.
- (g) For the purpose of this measure, CPAP breathing trial is a trial of unassisted breathing for a certain period of time administered while the patient is wearing any type of continuous positive airway pressure respiratory support device that prevents the airways from closing by delivering slightly pressurized air through a mask continuously or via electronic cycling throughout the breathing cycle.
- (h) For the purpose of this measure, the term “documentation” indicates explicit physician or respiratory therapist documentation of the reason that a patient was not deemed ready for SBT (including TCT or CPAP breathing trial) within the given time frame. Documentation must be dated prior to Day 2 of the LTCH stay.

Measure Specifications

S.1. Measure-specific Web Page *(Provide a URL link to a web page specific for this measure that contains current detailed specifications including code lists, risk model details, and supplemental materials. Do not enter a URL linking to a home page or to general information.) **

A draft version of the measure specifications, including item sets, will be posted at <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/MMS/CallforPublicComment.html> for solicitation of public comments.

S.4. Numerator Statement *(Brief, narrative description of the measure focus or what is being measured about the target population, i.e., cases from the target population with the target process, condition, event, or outcome)*
IF an OUTCOME MEASURE, state the outcome being measured. Calculation of the risk-adjusted outcome should be described in the calculation algorithm.

The numerator represents the number of patients admitted on invasive mechanical ventilation during the reporting period who were assessed for readiness for SBT (including TCT or CPAP breathing trial) by Day 2 of the LTCH stay and, if deemed ready, who received an SBT (including TCT or CPAP breathing trial) by Day 2 of the LTCH stay.

The numerator will be computed and reported separately according to each of the categories below. Each component numerator is the number of patients in the following categories:

- (1) Component 1, Percentage of Patients Assessed for Readiness for SBT by Day 2 of LTCH Stay: The numerator represents the number of patients admitted on invasive mechanical ventilation during the reporting period who were assessed for readiness for SBT (including TCT or CPAP breathing trial) by Day 2 of the LTCH stay
- (2) Component 2, Percentage of Patients Ready for SBT Who Received SBT by Day 2 of LTCH Stay: The numerator

represents the number of patients admitted on invasive mechanical ventilation during the reporting period who were ready for SBT and who received an SBT (including TCT or CPAP breathing trial) by Day 2 of the LTCH stay

S.5. Time Period for Data *(What is the time period in which data will be aggregated for the measure, e.g., 12 mo, 3 years, look back to August for flu vaccination? Note if there are different time periods for the numerator and denominator.)*

This quality measure will be analyzed and reported for all patients admitted during the reporting period. The time period for numerator and denominator are identical. At this time, we anticipate the time period to be 12 months to allow an adequate sample size for the majority of LTCHs in the United States. However, please note that this will be informed by findings from future analyses of data collected and submitted by LTCHs using items to be added to the LTCH CARE Data Set.

S.6. Numerator Details *(All information required to identify and calculate the cases from the target population with the target process, condition, event, or outcome such as definitions, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at S.2b)*

IF an OUTCOME MEASURE, describe how the observed outcome is identified/counted. Calculation of the risk-adjusted outcome should be described in the calculation algorithm.

(1) Component 1, Percentage of Patients Assessed for Readiness for SBT by Day 2 of LTCH Stay:

For the purpose of this measure component, a patient is considered in the numerator if the LTCH reports on the LTCH CARE Data Set Admission Assessment the following draft items:

O0200B = 1 (Yes) AND O0200C = 1 (Yes). Assessed for readiness for SBT by Day 2 of the LTCH Stay and Deemed medically ready for a SBT by Day 2 of the LTCH Stay.

OR

O0200B = 1 (Yes) AND O0200D = 1 (Yes): Assessed for readiness for SBT by Day 2 of the LTCH Stay and Documentation of reason(s) that patient was deemed medically unready for a SBT by Day 2 of the LTCH stay.

The sum of the numbers of patients in these two categories represents the number of patients admitted on invasive mechanical ventilation who were assessed for readiness for SBT by Day 2 of the LTCH stay, as reported on the Admission Assessment.

(2) Component 2, Percentage of Patients Ready for SBT Who Received SBT by Day 2 of LTCH Stay:

For the purpose of this measure component, a patient is considered in the numerator if the LTCH reports on the LTCH CARE Data Set Admission Assessment item **O0200E = 1 (Yes)**, SBT performed by Day 2 of the LTCH Stay.

Compliance with SBT (including TCT or CPAP breathing trial) by Day 2 of LTCH stay is reported as a percentage and is calculated and reported for these two numerator components separately.

S.7. Denominator Statement *(Brief, narrative description of the target population being measured)*

IF an OUTCOME MEASURE, state the target population for the outcome. Calculation of the risk-adjusted outcome should be described in the calculation algorithm (S.18).

The denominator is the total number of patients admitted to the LTCH during the reporting period who were on invasive mechanical ventilation support upon admission to the LTCH, for whom weaning attempts were expected or anticipated at admission. If a patient has more than one LTCH stay during the reporting period, each discharge will be included in the measure calculation and reporting.

There are two denominator components to this measure:

(1) Component 1, Percentage of Patients Assessed for Readiness for SBT by Day 2 of LTCH Stay:

- a. The denominator for Component 1 is the total number of patients admitted during the reporting period who were on invasive mechanical ventilation upon admission to an LTCH, for whom weaning attempts are expected or anticipated.

(2) Component 2, Percentage of Patients Ready for SBT Who Received SBT by Day 2 of LTCH Stay:

- a. The denominator for Component 2 is the subset of patients in the denominator of Component Measure 1, who were assessed and deemed ready for SBT by Day 2 of the LTCH stay.

S.8. Target Population Category (Check all the populations for which the measure is specified and tested if any):

- | | |
|---|--|
| <input type="checkbox"/> Children's Health | <input checked="" type="checkbox"/> Populations at Risk : Individuals with multiple chronic conditions |
| <input type="checkbox"/> Maternal Health | <input type="checkbox"/> Populations at Risk : Veterans |
| <input checked="" type="checkbox"/> Populations at Risk : Populations at Risk | <input checked="" type="checkbox"/> Senior Care |
| <input type="checkbox"/> Populations at Risk : Dual eligible beneficiaries | |

S.9. Denominator Details (All information required to identify and calculate the target population/denominator such as definitions, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at S.2b)

The denominator is the total number of patients admitted to the LTCH on invasive mechanical ventilation support during the reporting period, and for whom weaning attempts were expected or anticipated at admission.

(1) Component 1: For the calculation of the first component, “Percentage of Patients Assessed for Readiness for SBT by Day 2 of LTCH Stay,” an LTCH patient is included in the target population (denominator) if all the following criteria are met:

- a. The LTCH reports on the LTCH CARE Data Set Admission Assessment existing item **A0250**. Reasons for Admission = 01 (Admission) during the reporting period. Note: This item is part of the LTCH CARE Data Set, in use for data collection and reporting of patient-level data under the LTCH Quality Reporting Program (QRP), since October 1, 2012.
(AND)
- b. The LTCH selects on the LTCH CARE Data Set Admission Assessment item **O0200A**. Invasive Mechanical Ventilation Support upon Admission to the LTCH = 1 (Yes, Weaning),
(AND)

(2) Component 2, Percentage of Patients Ready for SBT Who Received SBT by Day 2 of LTCH Stay: Calculation includes all the above criteria (a and b), and in addition:

- c. The LTCH must indicate that the patient is medically ready for an SBT (including TCT or CPAP breathing trial) by recording “yes” (1) in response to item **O0200C**. Deemed Medically Ready for a SBT by Day 2 of the LTCH Stay.

For patients with more than one LTCH stay during the reporting period, each admission and discharge is included in the measure calculation and reporting. For example, if an LTCH patient is transferred to a short-stay acute care hospital for a procedure, surgery, or some other reason(s), returns to the LTCH within three (3) calendar days, and is subsequently

discharged from the LTCH, this is considered one “patient stay.” However, if this patient’s “stay” at the short-stay acute care hospital exceeds three (3) calendar days, whereby day one begins on the day of transfer from the LTCH to the short-stay acute care hospital, regardless of the hour of transfer, then a new LTCH CARE Data Set Admission Assessment is conducted upon return of the patient to the LTCH, and a second LTCH CARE Data Set Discharge Assessment accompanies the second discharge. Admission and Discharge (Planned or Unplanned) Assessments are completed for this patient for the first stay, and Admission and Discharge (Planned, Unplanned, or Expired) Assessments are completed for the second stay. Both stays for this patient are included in the measure calculation and reporting.

S.10. Denominator Exclusions *(Brief narrative description of exclusions from the target population)*

This measure (both Component 1 and Component 2) excludes patients with missing data and invasively mechanically ventilated patients identified as non-weaning at the time of admission to an LTCH. Consideration of a patient as non-weaning must be based on documentation found in the patient’s medical record.

After patient-level exclusions are applied, LTCHs with denominator counts of less than 20 in the sample during the reporting period will be excluded from public reporting, owing to small sample size.

S.11. Denominator Exclusion Details *(All information required to identify and calculate exclusions from the denominator such as definitions, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at S.2b)*

Patients are excluded from the target population (i.e., denominator) for both components if they meet either of the following criteria:

- (a) Admission Assessment item **O0200A**. Invasive Mechanical Ventilator = 0, No (i.e., No Ventilation Support on Admission), OR
- (b) Admission Assessment item **O0200A**. Invasive Mechanical Ventilator = 2, Yes, Non-Weaning (i.e., No Weaning Attempts are Expected or Anticipated at Admission)

Additionally, patients with missing data will be excluded.

After patient-level exclusions are applied, LTCHs with a denominator count of less than 20 patient stays during the reporting period will be excluded from future public reporting owing to small sample size.

S.12. Stratification Details/Variables *(All information required to stratify the measure results including the stratification variables, definitions, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format with at S.2b)*

This measure is not stratified.

S.13. Risk Adjustment Type *(Select type. Provide specifications for risk stratification in S.12 and for statistical model in S.14-15)*

- ☒ No risk adjustment or risk stratification
- ☐ Statistical risk model
- ☐ Stratification by risk category/subgroup
- ☐ Other (specify)

S.14. Identify the statistical risk model method and variables (*Name the statistical method - e.g., logistic regression and list all the risk factor variables. Note - risk model development and testing should be addressed with measure testing under Scientific Acceptability*)

This is not applicable.

S.15. Detailed risk model specifications (*must be in attached data dictionary/code list Excel or csv file. Also indicate if available at measure-specific URL identified in S.1.*)

Note: Risk model details (including coefficients, equations, codes with descriptors, definitions), should be provided on a separate worksheet in the suggested format in the Excel or csv file with data dictionary/code lists at S.2b.

☐ Available in attached Excel or csv file

☐ Provided in response box S.15a

This is not applicable.

S.16. Type of score: (Please select one of the following options)

☐ Count

☒ Rate/proportion

☐ Ratio

☐ Categorical , e.g., yes/no

☐ Continuous variable, e.g., average

☐ Other (specify):

S.17. Interpretation of Score (*Classifies interpretation of score according to whether better quality is associated with a higher score, a lower score, a score falling within a defined interval, or a passing score*)

☒ Better quality = higher score

☐ Better quality = lower score

☐ Better quality = score within a defined interval

☐ Passing score defines better quality

S.18. Calculation Algorithm/Measure Logic (*Describe the calculation of the measure score as an ordered sequence of steps including identifying the target population; exclusions; cases meeting the target process, condition, event, or outcome; aggregating data; risk adjustment; etc.*)

Measure Calculation Steps and Logic:

(1) Component 1, Percentage of Patients Assessed for Readiness for SBT by Day 2 of LTCH Stay = [Number of patients who were deemed ready for SBT by Day 2 of the LTCH Stay + Number of patients with documentation of medical unreadiness for SBT by Day 2 of the LTCH stay] * 100 / [All patients admitted on invasive mechanical ventilator support for any duration during the reporting period and for whom weaning attempts were expected or anticipated at admission]

(a) Of patients admitted to the LTCH during the reporting period, identify all patients who were admitted on invasive mechanical ventilation support upon admission to the LTCH. This is the target population.

(b) Of patients identified in (a) above, identify the subset of patients for whom weaning attempts are not expected or anticipated at admission. These patients are excluded from the measure.

(c) Of the patients identified in (a) above, identify the subset of patients for whom weaning attempts were

- expected or anticipated at admission. This is the denominator for Component 1 of the measure.
- (d) Of patients identified in (c) above, identify the subset of patients who were assessed for SBT by Day 2 of LTCH admission: those patients who were assessed and deemed ready for SBT, plus those patients who were assessed and documented as not ready for SBT. This is the numerator for component 1 of the measure.
- (e) Divide the results of Step (d) by Step (c).
- (2) Component 2, Percentage of Patients Ready for SBT Who Received SBT by Day 2 of LTCH Stay = $\frac{[\text{Number of patients who received an SBT (including TCT or CPAP breathing trial) by Day 2 of the LTCH Stay}]}{[\text{Number of patients who were deemed ready for SBT (including TCT or CPAP breathing trial) by Day 2 of the LTCH Stay}]} * 100$
- (f) Of the patients identified in (d) above, identify the subset of patients who were deemed ready for SBT (including TCT or CPAP breathing trial) by Day 2 of the LTCH stay. This is the denominator for component 2 of the measure.
- (g) Of the patients identified in (f) above, identify the number of patients who received an SBT (including TCT or CPAP breathing trial) by Day 2 of the LTCH stay. This is the numerator for component 2 of the measure.
- (h) Divide the results of Step (g) by Step (f).

S.23. Data Source (Check ONLY the sources for which the measure is SPECIFIED AND TESTED).

If other, please describe in 2a1.26.

- | | |
|---|---|
| <input type="checkbox"/> Administrative claims | <input type="checkbox"/> Healthcare Provider Survey |
| <input checked="" type="checkbox"/> Electronic Clinical Data : Electronic Clinical Data | <input type="checkbox"/> Management Data |
| <input type="checkbox"/> Electronic Clinical Data : Electronic Health Record | <input type="checkbox"/> Paper Medical Records |
| <input type="checkbox"/> Electronic Clinical Data : Imaging/Diagnostic Study | <input type="checkbox"/> Patient Reported Data/Survey |
| <input type="checkbox"/> Electronic Clinical Data : Laboratory | <input type="checkbox"/> Other |
| <input type="checkbox"/> Electronic Clinical Data : Pharmacy | |
| <input type="checkbox"/> Electronic Clinical Data : Registry | |

S.26. Level of Analysis (Check ONLY the levels of analysis for which the measure is SPECIFIED AND TESTED)

- | | |
|---|--|
| <input type="checkbox"/> Clinician : Individual | <input type="checkbox"/> Population : Community |
| <input type="checkbox"/> Clinician : Group/Practice | <input type="checkbox"/> Population : County or City |
| <input type="checkbox"/> Clinician : Team | <input type="checkbox"/> Population : National |
| <input checked="" type="checkbox"/> Facility | <input type="checkbox"/> Population : Regional |
| <input type="checkbox"/> Health Plan | <input type="checkbox"/> Population : State |
| <input type="checkbox"/> Integrated Delivery System | |

S.27. Care Setting (Check ONLY the settings for which the measure is SPECIFIED AND TESTED)

- | | |
|---|---|
| <input type="checkbox"/> Ambulatory Care : Ambulatory Surgery Center (ASC) | <input type="checkbox"/> Hospital/Acute Care Facility |
| <input type="checkbox"/> Ambulatory Care : Clinician Office/Clinic | <input type="checkbox"/> Imaging Facility |
| <input type="checkbox"/> Ambulatory Care : Outpatient Rehabilitation | <input type="checkbox"/> Laboratory |
| <input type="checkbox"/> Ambulatory Care : Urgent Care | <input type="checkbox"/> Pharmacy |
| <input type="checkbox"/> Behavioral Health/Psychiatric : Inpatient | <input type="checkbox"/> Post Acute/Long Term Care Facility : Nursing Home/Skilled Nursing Facility |
| <input type="checkbox"/> Behavioral Health/Psychiatric : Outpatient Dialysis Facility | <input type="checkbox"/> Post Acute/Long Term Care Facility : Inpatient Rehabilitation Facility |
| | <input checked="" type="checkbox"/> Post Acute/Long Term Care Facility : Long Term Acute Care |

- | | |
|---|-----------------------------------|
| <input type="checkbox"/> Emergency Medical Services/Ambulance | <input type="checkbox"/> Hospital |
| <input type="checkbox"/> Home Health | <input type="checkbox"/> Other |
| <input type="checkbox"/> Hospice | |

S.28. COMPOSITE Performance Measure - Additional Specifications (Use this section as needed for aggregation and weighting rules, or calculation of individual performance measures if not individually endorsed.)

This is not applicable.

Importance

Importance to Measure and Report is a threshold criterion that must be met in order to recommend a measure for endorsement. All three subcriteria must be met to pass this criterion. See guidance on evidence.

Opportunity for Improvement (Measure evaluation criterion 1a)

1b.1. Briefly explain the rationale for this measure (e.g., the benefits or improvements in quality envisioned by use of this measure)

IF a COMPOSITE (e.g. combination of component measure scores, all-or-none, any-or-none), SKIP this question and provide rationale for composite in question 1d.3 on the composite tab.

This ventilator-related process quality measure, Compliance with Spontaneous Breathing Trial (SBT) (including Tracheostomy Collar Trial (TCT) or Continuous Positive Airway Pressure (CPAP) Breathing Trial) by Day 2 of the LTCH Stay, is important for encouraging implementation of evidence-based weaning guidelines as early during LTCH patient stay as is beneficial to patients, in order to decrease LTCH patient exposure to adverse ventilator-associated morbidity and mortality.

Patients on invasive mechanical ventilation comprise a substantial proportion of LTCH patient admissions, and thus present a critical focus for assessment of high quality care. In Fiscal Year 2013, the LTCH MS-DRG for “Respiratory system diagnosis with ventilator support 96+ hours” (MS-DRG-LTCH 207) was the most frequently occurring diagnosis, accounting for 16,221 discharges, and over 11% of total discharges. The LTCH MS-DRG for “Respiratory system diagnosis with ventilator support < 96 hours” (MS-DRG-LTCH 208) accounted for an additional 2.3% of discharges in FY 2013 (MedPAC, 2015). Although often necessary for life support, invasive mechanical ventilation is not without risk of harm to patients, and these risks increase as duration of ventilation continues (Boles et al., 2007; Cox et al., 2007; Esteban et al., 2002; Penuelas et al., 2011). Studies have shown that prolonged mechanical ventilation of critically ill patients is associated with higher rates of mortality (Cox & Carson, 2012; Dries, 1997; Kahn, Benson, Appleby, Carson, & Iwashyna, 2010; Mancebo, 1996) and morbidity, including ventilator-associated pneumonia (Cook et al., 1998), delirium (Ely et al., 2001), ventilator associated lung injury (Meade & Cook, 1995; Meade, Cook, Kernerman, & Bernard, 1997; Slutsky & Tremblay, 1998), functional impairment, respiratory muscle weakness, upper airway pathology, myopathy, neuropathy, alterations in body composition, depression, anxiety, agitation, and the chronic critical illness syndrome (Ambrosino & Gabbriellini, 2010; Barnato, Albert, Angus, Lave, & Degenholtz, 2011; Burns, Meade, Premji, & Adhikari, 2014; Cox & Carson, 2012; Cox et al., 2007; Jubran et al., 2010; Nelson, Cox, Hope, & Carson, 2010). Mechanical ventilation is also associated with increased costs. Studies in the ICU setting indicate that patients who require mechanical ventilation have 50% higher costs than patients who do not receive mechanical ventilation (Dasta, McLaughlin, Mody, & Piech, 2005). Patients who receive mechanical ventilation ≥96 hours had a median hospital cost of \$40,903 compared to \$13,434 for those who received mechanical ventilation <96 hours (Zilberberg, de Wit, & Shorr, 2012). Patients on prolonged ventilation (≥21 days) incur even greater health care costs; the estimated cost per one-year survival for patients who are ventilated for ≥21 days is \$423,596 (Cox et al., 2007).

Discontinuation of invasive mechanical ventilation, known as weaning or liberation, is associated with improved patient health outcomes. In LTCHs, fewer days of mechanical ventilation may lead to decreased risk of ventilator-associated complications/events, enhanced rehabilitation opportunities, and shorter LOS (Hassenpflug et al., 2015); a higher weaning rate has been associated with lower post-discharge mortality, even in the very elderly (Aboussouan, Lattin, & Kline, 2008; Frengley, Sansone, Shakya, & Kaner, 2014; Hassenpflug, Steckart, & Nelson, 2011, 2014; Stearn-Hassenpflug, Steckart, & Nelson, 2013). However, prior studies have shown that some physicians may underestimate the probability of weaning success (MacIntyre, 2013; Strickland & Hasson, 1993; Stroetz & Hubmayr, 1995). Common causes of weaning delays include clinician delays in recognizing that weaning may be possible and in beginning evaluation of weaning readiness (Boles et al., 2007). Many patients may be ready to breathe spontaneously sooner than their physician anticipates (Epstein, 2009).

In 2005, an international task force convened and developed recommendations to address the entire weaning process. This task force recommended that weaning be considered as soon as possible, because failure to assess the patient for readiness to wean may lead to undue prolonged mechanical ventilation and expose patients unnecessarily to adverse ventilator-associated morbidity and mortality. Evidence continues to support early assessment of weaning criteria and performance of spontaneous breathing trial as soon as safely possible (Brochard & Thille, 2009; Frutos-Vivar & Esteban, 2014; Kaplan & Toevs, 2013; Loik, 2015; MacIntyre, 2013; McConville & Kress, 2012; Penuelas, Thille, & Esteban, 2015; Thille, Cortes-Puch, & Esteban, 2013; White, 2012). Current weaning protocols include these weaning processes (Blackwood, Burns, Cardwell, & O'Halloran, 2014; Burns, Lellouche, Lessard, & Friedrich, 2014; Hassenpflug et al., 2015).

In a study of ventilator weaning in an LTCH by Jubran and colleagues (Jubran et al., 2013), 32% of newly admitted LTCH patients on invasive mechanical ventilation were able to breathe unassisted during the first 5 days of the study, suggesting that many ICU patients sent to LTCHs for “failure to wean” from the ventilator may not have undergone ventilator weaning attempts during the latter part of their stay in an ICU (Kahn & Carson, 2013). That a substantial portion of newly admitted LTCH patients could be weaned within 5 days underscores the need to assess patients’ ability to breathe without assistance soon after admission, in order to identify individuals who are able to discontinue invasive mechanical ventilation.

Because invasive mechanical ventilation should be discontinued as soon as patients are capable of breathing independently (Blackwood et al., 2011), unnecessarily prolonged mechanical ventilation can be an indicator of poor quality care or of persistent illness (MacIntyre, 2013). This quality measure is designed to encourage adherence to evidence-based and consensus based guidelines through implementation of trials of unassisted breathing and early assessment of weaning criteria. The anticipated improvement in quality is an improvement in timeliness of weaning and ventilator liberation for patients admitted to LTCHs on invasive mechanical ventilation. Additionally, facilities can use results of this measure to improve early compliance with evidence-based weaning guidelines and develop ventilator weaning quality improvement programs.

Citations:

- Aboussouan, L. S., Lattin, C. D., & Kline, J. L. (2008). Determinants of long-term mortality after prolonged mechanical ventilation. *Lung*, 186(5), 299-306. doi:10.1007/s00408-008-9110-x
- Ambrosino, N., & Gabbriellini, L. (2010). The difficult-to-wean patient. *Expert Rev Respir Med*, 4(5), 685-692. doi:10.1586/ers.10.58
- Barnato, A. E., Albert, S. M., Angus, D. C., Lave, J. R., & Degenholtz, H. B. (2011). Disability among elderly survivors of mechanical ventilation. *Am J Respir Crit Care Med*, 183(8), 1037-1042. doi:10.1164/rccm.201002-0301OC
- Blackwood, B., Alderdice, F., Burns, K., Cardwell, C., Lavery, G., & O'Halloran, P. (2011). Use of weaning protocols for reducing duration of mechanical ventilation in critically ill adult patients: Cochrane systematic review and meta-analysis. *BMJ*, 342, c7237. doi:10.1136/bmj.c7237
- Blackwood, B., Burns, K. E., Cardwell, C. R., & O'Halloran, P. (2014). Protocolized versus non-protocolized weaning for reducing the duration of mechanical ventilation in critically ill adult patients. *Cochrane Database Syst Rev*, 11, Cd006904. doi:10.1002/14651858.CD006904.pub3
- Boles, J. M., Bion, J., Connors, A., Herridge, M., Marsh, B., Melot, C., . . . Welte, T. (2007). Weaning from mechanical ventilation. [Cited in Impact and Gap need to add to risk factors]. *Eur Respir J*, 29(5), 1033-1056. doi:10.1183/09031936.00010206
- Brochard, L., & Thille, A. W. (2009). What is the proper approach to liberating the weak from mechanical ventilation? *Crit Care Med*, 37(10 Suppl), S410-415. doi:10.1097/CCM.0b013e3181b6e28b

- Burns, K. E., Lellouche, F., Lessard, M. R., & Friedrich, J. O. (2014). Automated weaning and spontaneous breathing trial systems versus non-automated weaning strategies for discontinuation time in invasively ventilated postoperative adults. *Cochrane Database Syst Rev*, 2, CD008639. doi:10.1002/14651858.CD008639.pub2
- Burns, K. E., Meade, M. O., Premji, A., & Adhikari, N. K. (2014). Noninvasive ventilation as a weaning strategy for mechanical ventilation in adults with respiratory failure: a Cochrane systematic review. *CMAJ*, 186(3), E112-122. doi:10.1503/cmaj.130974
- Cook, D. J., Walter, S. D., Cook, R. J., Griffith, L. E., Guyatt, G. H., Leasa, D., . . . Brun-Buisson, C. (1998). Incidence of and risk factors for ventilator-associated pneumonia in critically ill patients. *Ann Intern Med*, 129(6), 433-440. Retrieved from <http://annals.org/article.aspx?articleid=711674>
- Cox, C. E., & Carson, S. S. (2012). Medical and economic implications of prolonged mechanical ventilation and expedited post-acute care. *Semin Respir Crit Care Med*, 33(4), 357-361. doi:10.1055/s-0032-1321985
- Cox, C. E., Carson, S. S., Lindquist, J. H., Olsen, M. K., Govert, J. A., & Chelluri, L. (2007). Differences in one-year health outcomes and resource utilization by definition of prolonged mechanical ventilation: a prospective cohort study. *Crit Care*, 11(1), R9. doi:10.1186/cc5667
- Dasta, J. F., McLaughlin, T. P., Mody, S. H., & Piech, C. T. (2005). Daily cost of an intensive care unit day: the contribution of mechanical ventilation. *Crit Care Med*, 33(6), 1266-1271.
- Dries, D. J. (1997). Weaning from mechanical ventilation. *J Trauma*, 43(2), 372-384.
- Ely, E. W., Inouye, S. K., Bernard, G. R., Gordon, S., Francis, J., May, L., . . . Dittus, R. (2001). Delirium in mechanically ventilated patients: validity and reliability of the confusion assessment method for the intensive care unit (CAM-ICU). *JAMA*, 286(21), 2703-2710.
- Epstein, S. K. (2009). Weaning from ventilatory support. *Curr Opin Crit Care*, 15(1), 36-43. doi:10.1097/MCC.0b013e3283220e07
- Esteban, A., Anzueto, A., Frutos, F., Alia, I., Brochard, L., Stewart, T. E., . . . Mechanical Ventilation International Study, G. (2002). Characteristics and outcomes in adult patients receiving mechanical ventilation: a 28-day international study. *JAMA*, 287(3), 345-355. Retrieved from <http://jama.jamanetwork.com/data/Journals/JAMA/4816/JCE10020.pdf>
- Frengley, J. D., Sansone, G. R., Shakya, K., & Kaner, R. J. (2014). Prolonged mechanical ventilation in 540 seriously ill older adults: effects of increasing age on clinical outcomes and survival. *J Am Geriatr Soc*, 62(1), 1-9. doi:10.1111/jgs.12597
- Frutos-Vivar, F., & Esteban, A. (2014). Our paper 20 years later: how has withdrawal from mechanical ventilation changed? *Intensive Care Med*, 40(10), 1449-1459. doi:10.1007/s00134-014-3362-0
- Hassenpflug, M. S., Douglas, V., Rafael, S., David, R. N., Scott, A. S., & Steckart, M. J. (2015). Post-ICU Mechanical Ventilation: Outcomes of the Revised Therapist-Implemented Patient-Specific (TIPS?) Weaning Protocol B44. *Invasive And Non-Invasive Mechanical Ventilation* (pp. A3166-A3166): American Thoracic Society.
- Hassenpflug, M. S., Steckart, J., & Nelson, D. R. (2011). *Post-ICU Mechanical Ventilation: Extended Care Facility Residents Transferred From Intensive Care To Long-Term Acute Care*. Paper presented at the American Thoracic Society 2011 International Conference, Denver, Colorado.
- Hassenpflug, M. S., Steckart, J., & Nelson, D. R. (2014). *Post-ICU Mechanical Ventilation: Updates to Population Characteristics, Weaning Outcomes and Discharge Disposition*. Paper presented at the Society of Critical Care Medicine (SCCM) 2014 Critical Care Congress, San Francisco, CA.
- Hess, D. R., & MacIntyre, N. R. (2011). Ventilator discontinuation: why are we still weaning? *Am J Respir Crit Care Med*, 184(4), 392-394. doi:10.1164/rccm.201105-0894ED
- Jubran, A., Grant, B. J., Duffner, L. A., Collins, E. G., Lanuza, D. M., Hoffman, L. A., & Tobin, M. J. (2013). Effect of pressure support vs unassisted breathing through a tracheostomy collar on weaning duration in patients requiring prolonged mechanical ventilation: a randomized trial. *JAMA*, 309(7), 671-677. doi:10.1001/jama.2013.159
- Jubran, A., Lawm, G., Kelly, J., Duffner, L. A., Gungor, G., Collins, E. G., . . . Tobin, M. J. (2010). Depressive disorders during weaning from prolonged mechanical ventilation. *Intensive Care Med*, 36(5), 828-835. doi:10.1007/s00134-010-1842-4
- Kahn, J. M. (2015). Improving outcomes in prolonged mechanical ventilation: a road map. *Lancet Respir Med*, 3(7), 501-502. doi:10.1016/S2213-2600(15)00205-2
- Kahn, J. M., Benson, N. M., Appleby, D., Carson, S. S., & Iwashyna, T. J. (2010). Long-term acute care hospital utilization after critical illness. *JAMA*, 303(22), 2253-2259. doi:10.1001/jama.2010.761
- Kahn, J. M., & Carson, S. S. (2013). Generating evidence on best practice in long-term acute care hospitals. *JAMA*, 309(7), 719-720. doi:10.1001/jama.2013.848
- Kaplan, L. J., & Toevs, C. C. (2013). Weaning from mechanical ventilation. *Curr Probl Surg*, 50(10), 489-494. doi:10.1067/j.cpsurg.2013.08.014
- Loik, P. S. (2015). The spontaneous breathing trial: separating fact from fiction. *Respir Care*, 60(2), 306. doi:10.4187/respcare.03958

- MacIntyre, N. R. (2013). The ventilator discontinuation process: an expanding evidence base. *Respir Care*, 58(6), 1074-1086. doi:10.4187/respcare.02284
- MacIntyre, N. R., Epstein, S. K., Carson, S., Scheinhorn, D., Christopher, K., Muldoon, S., & National Association for Medical Direction of Respiratory, C. (2005). Management of patients requiring prolonged mechanical ventilation: report of a NAMDRC consensus conference. *Chest*, 128(6), 3937-3954. doi:10.1378/chest.128.6.3937
- Mancebo, J. (1996). Weaning from mechanical ventilation. *Eur Respir J*, 9(9), 1923-1931. Retrieved from <http://erj.ersjournals.com/content/9/9/1923.full.pdf>
- McConville, J. F., & Kress, J. P. (2012). Weaning patients from the ventilator. *N Engl J Med*, 367(23), 2233-2239. doi:10.1056/NEJMra1203367
- Meade, M. O., & Cook, D. J. (1995). The aetiology, consequences and prevention of barotrauma: a critical review of the literature. *Clin Intensive Care*, 6(4), 166-173.
- Meade, M. O., Cook, D. J., Kernerman, P., & Bernard, G. (1997). How to use articles about harm: the relationship between high tidal volumes, ventilating pressures, and ventilator-induced lung injury. *Crit Care Med*, 25(11), 1915-1922.
- MedPAC. (2015). *Chapter 11. Long-term Care Hospital Services. In: Report to the Congress: Medicare Payment Policy.* Retrieved from Washington, DC: <http://medpac.gov/documents/reports/chapter-11-long-term-care-hospital-services-%28march-2015-report%29.pdf?sfvrsn=0>
- Nelson, J. E., Cox, C. E., Hope, A. A., & Carson, S. S. (2010). Chronic critical illness. *Am J Respir Crit Care Med*, 182(4), 446-454. doi:10.1164/rccm.201002-0210CI
- Penuelas, O., Frutos-Vivar, F., Fernandez, C., Anzueto, A., Epstein, S. K., Apezteguia, C., . . . Esteban, A. (2011). Characteristics and outcomes of ventilated patients according to time to liberation from mechanical ventilation. *Am J Respir Crit Care Med*, 184(4), 430-437. doi:10.1164/rccm.201011-1887OC
- Penuelas, O., Thille, A. W., & Esteban, A. (2015). Discontinuation of ventilatory support: new solutions to old dilemmas. *Curr Opin Crit Care*, 21(1), 74-81. doi:10.1097/mcc.0000000000000169
- Rose, L., Fowler, R. A., Fan, E., Fraser, I., Leasa, D., Mawdsley, C., . . . Rubenfeld, G. (2015). Prolonged mechanical ventilation in Canadian intensive care units: a national survey. *J Crit Care*, 30(1), 25-31. doi:10.1016/j.jcrc.2014.07.023
- Slutsky, A. S., & Tremblay, L. N. (1998). Multiple system organ failure. Is mechanical ventilation a contributing factor? *Am J Respir Crit Care Med*, 157(6 Pt 1), 1721-1725. doi:10.1164/ajrccm.157.6.9709092
- Stearn-Hassenpflug, M., Steckart, M., & Nelson, D. (2013). 678: Post-ICU Mechanical Ventilation: Trends in Mortality and 12-month Post-discharge Survival. *Critical Care Medicine*, 41(12), A166. doi:10.1097/01.ccm.0000439916.52441.12
- Strickland, J. H., Jr., & Hasson, J. H. (1993). A computer-controlled ventilator weaning system. A clinical trial. *Chest*, 103(4), 1220-1226. Retrieved from <http://journal.publications.chestnet.org/data/Journals/CHEST/21669/1220.pdf>
- Stroetz, R. W., & Hubmayr, R. D. (1995). Tidal volume maintenance during weaning with pressure support. *Am J Respir Crit Care Med*, 152(3), 1034-1040. doi:10.1164/ajrccm.152.3.7663780
- Thille, A. W., Cortes-Puch, I., & Esteban, A. (2013). Weaning from the ventilator and extubation in ICU. *Curr Opin Crit Care*, 19(1), 57-64. doi:10.1097/MCC.0b013e32835c5095
- White, A. C. (2012). Long-term mechanical ventilation: management strategies. *Respir Care*, 57(6), 889-897; discussion 898-889. doi:10.4187/respcare.01850
- Zilberberg, M. D., de Wit, M., & Shorr, A. F. (2012). Accuracy of previous estimates for adult prolonged acute mechanical ventilation volume in 2020: update using 2000-2008 data. *Crit Care Med*, 40(1), 18-20. doi:10.1097/CCM.0b013e32822e9ffd

1b.2. Provide performance scores on the measure as specified (current and over time) at the specified level of analysis. (This is required for endorsement maintenance. Include mean, std dev, min, max, interquartile range, scores by decile. Describe the data source including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities include). This information also will be used to address the subcriterion on improvement (4b.1) under Usability and Use.

This is not applicable.