

MEDCAC – Value of Clinical Registries: Acute Ischemic Stroke Thrombectomy Outcomes

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Disclosure Statement Of Financial Interest

Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

- **Grant/Clinical Trial Research Support**

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	1R01HL149787 (PI)	1U01NS080168 (Co-I) CREST
	2R01HL115267 (PI)	1R01NS097876 (PI) CREST-H

- **Industry Research Support / Consulting:**

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Microvention, Medtronic, Penumbra Fellow Training Grants (PI/ Departmental)
Microvention SOFAST – Clinical Events Adjudicator
Medtronic EMBOLISE – Data Monitoring Committee
Boston Scientific – Clinical Trial Advisory Committee



Disclosure Statement Of Affiliations

I, (Sameer A. Ansari) DO NOT have a relevant financial interest/arrangement, BUT affiliations with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation.

- **SNIS Board Member 2015-2021**
Medical Director, SNIS Patient Safety Organization
NVQI-QOD Data Registry Governance Council
- **Co-Chair, FDA CRN-DAISI Governing Council**



ACA / MACRA ?

Why Change the System?



CMS

- **Center for Medicare and Medicaid Service (CMS)**

Established by Lyndon Johnson 1965 (“Great Society”)

4 Payor Components:

Part A – Hospital Costs

Part B – Physician Fees / Outpatient Services

Part C – Medicare Advantage (Private Insurance Co-op)

Part D – Prescription Drug Costs

- **Funded by Hospital Insurance Trust (Part A) and Supplementary Medical Insurance Trusts (Part B and D)**

General Tax Revenues (73%), Beneficiary Premiums (25%) + Interest

Solvency of HIT (Part A) through 2030

SMIT (Part B and D), Funded Annually to Match Spending



History – Fee For Service Model

- **1965 –1975 “Golden Age”, Physician Control of Billing**
Based on Historic Charges + Billing Beneficiaries Above Collections
- **1975 – Medicare Economic Index (MEI)**
1st Limit of Physician Fee Increases to Fixed Schedule, **BUT ↑ Costs**
- **1982 – Tax Equity and Fiscal Responsibility Act,**
DRG – Fixed Fees
- **1984 – 1991 – Congress Compensated with Annual Increases**
- **1989 – 1992 – Omnibus Budget Reconciliation Act (George Bush)**
Historic Event of Controlling Physician Payments via
RBRVS – Resource-Based Relative Value Scale (RVU Model)
Physician Input via 2 AMA Committees Recommend Reimbursement Values:
→ **CPT Editorial Panel and RUC (RVS Update Committee)**
CMS Determines Annual **Medicare Physician Fee Schedules via**
Medicare Volume Performance Standards (MVPS) to Control Cost
→ **Policies Inadvertently Incentivized Volume**

SGR

- **1997 – Balanced Budget Act (Clinton / Congress)**

Burden of Balancing Budget Deficit Placed on Healthcare Industry

Sustainable Growth Rate (SGR) Formula – Linked to GDP

To Limit the Annual Increases in Provider Fees (**Only Part B-Physician**)

Conversion Factor 1st Turned Negative in 2002 with 4.8% Cut !

Attributed to Changes in Medicare Enrollees, Physician Costs,
Legal/Regulatory Costs, Inflation and ↓**GDP (Economic Crisis)**

- **2003 – 2015 Congress SGR Interventions (Until ACA-MACRA Rule)**

“The Medicare Modernization Act 2004-2005” “Deficit Reduction Act 2006”

→ Compensated for the Negative SGR with an Unsustainable Cost!

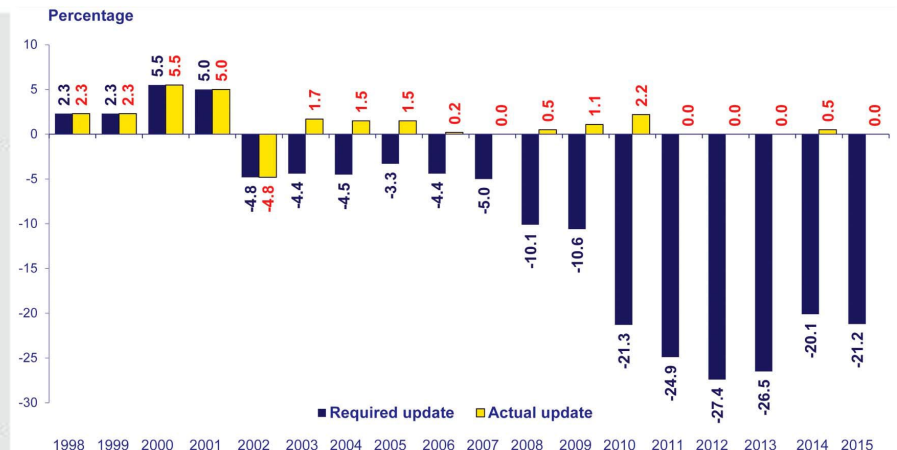
IF SGR Continued Unabated, Threatened >20% Annual Reductions in 2010-15

Farb et al
Hirsch et al

Table 1 CBO estimates of the cost of simple sustainable growth rate fixes¹⁵

Score date (month/year)	Fee freeze 10-year score (in billions of US\$)	MEI update 10-year score (in billions of US\$)
3/2005	48.6	154.5
3/2007	177.7	262.1
5/2009	285	344
6/2011	297.6	358.1
7/2012	271	362
11/2012	243.7	No estimate
2/2013	138	No estimate
5/2013	139.1	224.8
11/2014	118.9	204.3
1/2015	137	No estimate

CBO, Congressional Budget Office; MEI, Medicare Economic Index; SGR, sustainable growth rate

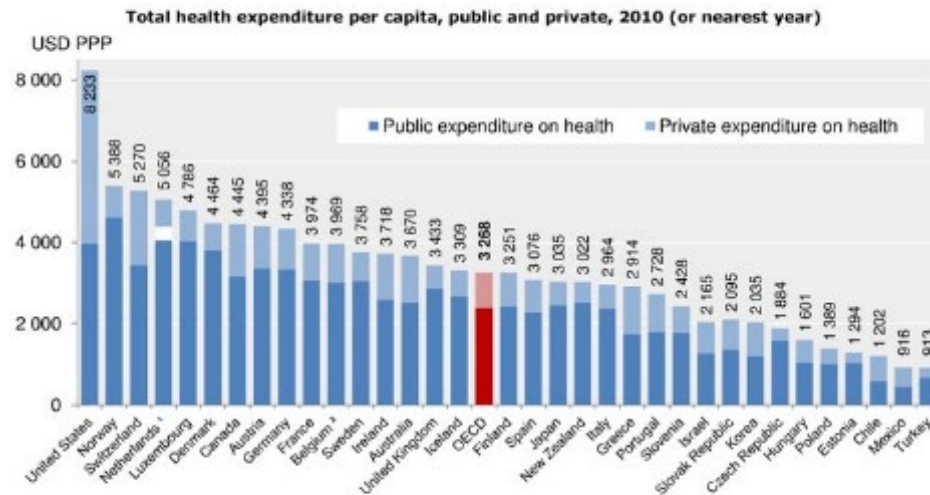


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INTERVENTIONAL NEUROLOGY

ACA / MACRA ?

What About Quality vs High Cost? American HealthCare (Exceptionalism)?

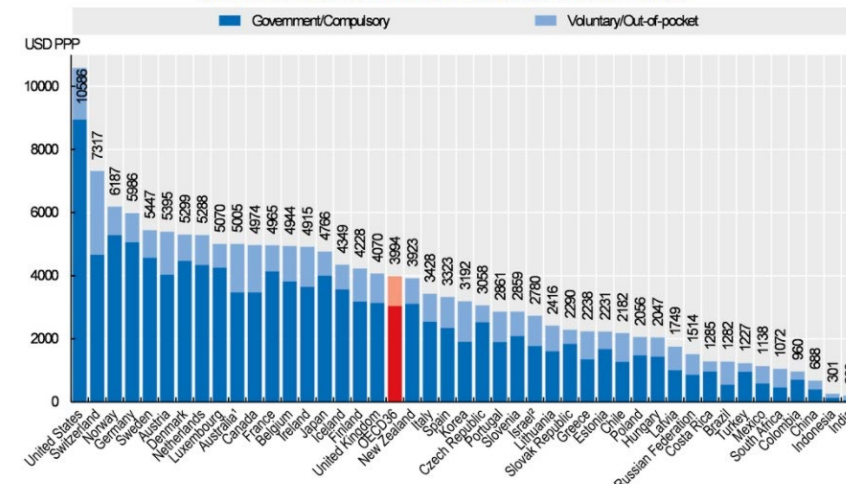
US spends two-and-a-half times the OECD average



1. In the Netherlands, it is not possible to clearly distinguish the public and private share related to investments.
2. Total expenditure excluding investments.
Information on data for Israel: <http://dx.doi.org/10.1787/888932315602>.

Source: OECD Health Data 2012.

Figure 7.1. Health expenditure per capita, 2018 (or nearest year)



Note: Expenditure excludes investments, unless otherwise stated.











1. Australia expenditure estimates exclude all expenditure for residential aged care facilities in welfare (social) services. 2. Includes investments.

Source: OECD Health Statistics 2019, WHO Global Health Expenditure Database.

ACA / MACRA ?

What About Quality vs Cost? American HealthCare (Exceptionalism)? POOR VALUE

EXHIBIT ES-1. OVERALL RANKING

COUNTRY RANKINGS										
<div>Top 2*</div> <div>Middle</div> <div>Bottom 2*</div>										
										
	AUS	CAN	FRA	GER	NETH	NZ	NOR	SWE	SWIZ	UK
OVERALL RANKING (2013)	4	10	9	5	5	7	7	3	2	1
Quality Care	2	9	8	7	5	4	11	10	3	1
Effective Care	4	7	9	6	5	2	11	10	8	1
Safe Care	3	10	2	6	7	9	11	5	4	1
Coordinated Care	4	8	9	10	5	2	7	11	3	1
Patient-Centered Care	5	8	10	7	3	6	11	9	2	1
Access	8	9	11	2	4	7	6	4	2	1
Cost-Related Problem	9	5	10	4	8	6	3	1	7	1
Timeliness of Care	6	11	10	4	2	7	8	9	1	3
Efficiency	4	10	8	9	7	3	4	2	6	1
Equity	5	9	7	4	8	10	6	1	2	2
Healthy Lives	4	8	1	7	5	9	6	2	3	10
Health Expenditures/Capita, 2011**	\$3,800	\$4,522	\$4,118	\$4,495	\$5,099	\$3,182	\$5,669	\$3,925	\$5,643	\$3,405
	US									

Notes: * Includes ties. ** Expenditures shown in \$US PPP (purchasing power parity); Australian \$ data are from 2010.

Sources: Calculated by the Commonwealth Fund based on 2011 International Health Policy Survey of Sicker Adults; 2012 International Health Policy Survey of Primary Care Physicians; 2013 International Health Policy Survey; Commonwealth Fund National Scorecard 2011; World Health Organization; and Organisation for Economic Cooperation and Development, OECD Health Data, 2013 (Paris: OECD, Nov. 2013).

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ACA

- **Patient Protection and Affordable Care Act (ACA) ~ \$940 Billion**
 - Signed Law March 2010, Failed Supreme Court Challenge / Divided 10 Titles
 - Monumental Change – 1965 Social Securities Act / Medicare
 - **Increased Revenue = Taxes + Medicare Cuts (\$500 Billion/10 Years)**
 - 1) **Universal Health Care Coverage – “Individual and Employer Mandates”**
 - Private** Insurance – Personal and Business Mandates
 - State** Based Health Insurance Exchanges
 - ↑ **Federal** Expansion of Medicaid
 - 2) **Gradual Transition to Value (via MACRA/QPP-Quality Payment Program)**
 - Reduce Cost, BUT Preserve/Enhance Quality of Care –**
APMs, (ACOs, MSSP, BPCI) vs MIPS Payment Models
- **ACA Established Two Independent Boards and CMMI**
 - **Patient Centered Outcomes Research Institute (PCORI) – Quality**
Conduct Comparative Effectiveness Research and Funding
 - **Independent Payment Advisory Board (IPAB) – Cost**
 - **CMS Innovation Center – Develop/Test Novel Payment Models – Value**



MACRA

- **Medicare Access and CHIP Reauthorization Act 2015 (MACRA) –**

Enacted in April 2015, Final Rule October 2016

- **Ended the Sustainable Growth Rate (SGR) Formula and Fiscal Instability**
- **Locked Medicare Part B Reimbursement at Near Zero Growth
(Physicians, NP, PA, CRNA Provider Payments)**

2016-2019: 0.5% Annual Increase

2020-2025: 0.0% Annual Increase

2026 +: 0.25% Or 0.75% Annual Increase Depending On Payment Track

- **New Framework for Rewarding Health Care Providers**
Value (= Quality/Cost) > Volume (and Care Duplication)
→ **Combined Existing Quality Reporting Programs into QPP**
- **Quality Payment Program (QPP) to Assess Provider Performance:**
 - 1) **Merit-Based Incentive Payment System (MIPS)**
Fee for Service + Quality/Value Metrics
 - 2) **Advanced Alternative Payment Models (APMs)**



MACRA / MIPS

- **MACRA Required New Merit-Based Incentive Payment System (MIPS)**
 - Consolidated: **Physician Quality Reporting System (PQRS) + Physician Value-Based Payment Modifier (VM) + Medicare Electronic Health Record (EHR) Incentive Program** for Physicians to Sunset and Ended in 2018
- **MIPS Performance Assessed in 4 Categories:**
 - 1) **Quality** – Clinicians Choose To Report On 6 Out Of Over 200 Measures, Based On PQRS – 1 Outcome and 1 Cross-Cutting Measure
Clinical : HTN Control, BMI or Tobacco Screening

Radiology MIPS Measures Diagnostic vs Interventional

eg QCDRs (NRDR, VQI, NVQI-QOD)

Table 2. MIPS performance measures for radiologists, as listed within the CMS proposed ruling

Fluoroscopy exposure time
Inappropriate use of "probably benign" assessment category in mammographic screening
Correlation with existing imaging studies for all patients undergoing bone scintigraphy
Stenosis measurement in carotid imaging reports
Reminder system for screening mammography
Use of a standardized nomenclature for CT imaging
Count of potential high-dose radiation imaging studies: CT and cardiac nuclear medicine studies
Reporting to a radiation dose index registry
CT images available for patient follow-up and comparison purposes
Search for prior CT studies through a secure, authorized, media-free, shared archive
Follow-up CT imaging for incidentally detected pulmonary nodules according to recommended guidelines
Appropriate follow-up imaging for incidental abdominal lesions
Appropriate follow-up imaging for incidental thyroid nodules in patients
Use of dose-lowering techniques for adult CT
Rate of EVAR of small or moderate nonruptured AAA without major complications (discharged home by postoperative day 2)
Biopsy follow-up
Rate of CAS for asymptomatic patients, without major complications (discharged home by postoperative day 2)
Rate of postoperative stroke or death in asymptomatic patients undergoing CAS

Rosenkrantz et al. JACR 2016



MACRA / MIPS

- **MIPS Performance Assessed in 4 Categories**

1) Quality –

2) Resource Use – Episode Based Cost

Score Based On Medicare Claims, No Reporting Requirement

Total Per Capita versus Episode-Based Cost Measures For Specialists
Assess Appropriate Risk Adjusted Utilization (Part D Costs)

3) Meaningful Use – Certified EHR Technology/Information Exchange

→ “Advanced Care Information” – Replaces MU

Requires Reporting 11 Measures / 6 Objectives

Scored On Participation And Performance

eg **QCDR Registries – Electronic Reporting**

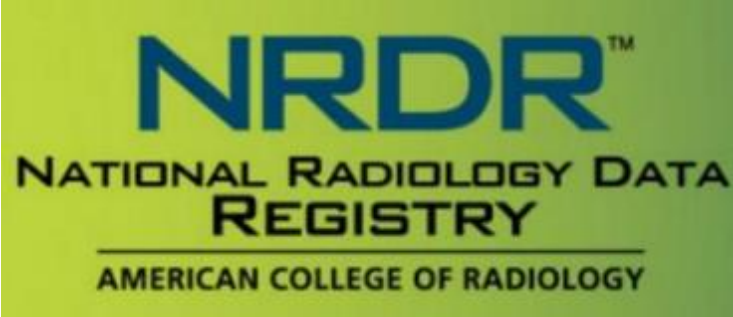
4) Clinical Practice Improvement Activities –

9 Categories – High Priority, Over 90 Activities To Choose

Rewards For Care Coordination, Patient Engagement, and Patient Safety

eg **Patient Satisfaction Surveys, 24/7 Access, Public Health Initiatives**
QCDR (+ PSO Activities)





MIPS Qualified Clinical Data Registries (QCDR)

MACRA Statute

“Under MIPS, the Secretary shall encourage the use of qualified clinical data registries (QCDR)”



MIPS / QCDR

- **MIPS Reporting Mechanisms for Eligible Clinicians (EC):**
 - 1) Medicare Part B Claims Reporting (Resource Use / Cost)
 - 2) Direct Electronic Health Record (EHR) Reporting
 - 3) Qualified Registry or **QCDR**
- **CMS Encourages QCDR Participation – Efficient and Diverse**
 - Specialty Specific (Neurointerventional?) QCDRs –“New and Innovative Quality Measures”
 - Option to Use, Maintain and Develop Non-MIPS Measures by Entity Sponsoring the QCDR (ACR NRDR, SVS VQI, or **SNIS NVQI-QOD?**)
 - **QCDRs May Nominate ≤ 30 Measures Reviewed/Approved by CMS**
 - **QCDRs Fulfill ALL Reportable MIPS Performance Categories**
Quality, CPIA, ACI – Reportable Measures
 - **Bonus Points** for High Priority Measures and Electronic Reporting → QCDRs
Patient Outcomes/Safety, Efficiency, Appropriate Use, Experience, Care Coordination



Quality Data Registries Promote Clinical Excellence

Quality Assurance (Patients)

- Assess Procedural Safety/Efficacy – Complications/Outcomes
- Deliver Site Feedback, Prospective / Serial Data Monitoring

Clinical Practice Improvement (Providers)

- Promote Establishment of Best Practice Protocols / Process Improvement
- Enable Education / Evidence Based Medicine – Practice

Clinical Value (CMS/Payers)

- Risk Adjusted Quality Outcomes Compared Across Providers
- Resource Utilization for Cost Effectiveness

Clinical Trials and Device Evaluation (FDA/Industry)

- Advance Knowledge and Enable Research (**Academia**)
- Expanding Off-Label Indications



SNIS Patient Safety Organization (PSO)

Neurovascular Quality Initiative (NVQI) Quality Data Registry - Neurointerventional Procedures



AHRQ Certification – SNIS PSO



DEPARTMENT OF HEALTH AND HUMAN SERVICES

Agency for Healthcare
Research and Quality

5600 Fishers Lane
Rockville, MD 20857
www.ahrq.gov

SENT VIA ELECTRONIC AND TRACKED MAIL

February 04, 2020

Marie Williams
Executive Director
Society of NeuroInterventional Surgery (SNIS) PSO, P0153
12587 Fair Lakes Circle, Suite 353
Fairfax, VA 22033

Dear Ms. Williams:

It is my pleasure to inform you that the Agency for Healthcare Research and Quality (AHRQ) has accepted your certifications for continued listing as a Patient Safety Organization for another three-year period. Your new period of listing will expire at midnight (2400 hours) on February 25, 2023.



AHRQ – Agency for Healthcare Research and Quality

Patient Safety Research

- **Patient Safety Act (July 2005) –**

The Patient Safety and Quality Improvement Act (Patient Safety Act) amended Title IX of the Public Health Service Act. The statute provides for the improvement of patient safety and the reduction of the incidence of events that adversely affect patient safety.

- **Patient Safety Rule (November 2008) –**

The Patient Safety and Quality Improvement final rule (Patient Safety Rule) establishes a framework by which hospitals, doctors, and other health care providers may voluntarily report information to Patient Safety Organizations (PSOs), on a privileged and confidential basis, for the aggregation and analysis of patient safety events.



AHRQ / Patient Safety Organization (PSO)

PSO Functions:

- Creates Safe and Confidential Reporting QA Environment
Patient Safety Evaluation System (PSES) and Work Product (PSWP)
Medicolegal Protection at Federal Level
- Provide Efficient Reporting Results (**via Registries**)
- Enable Analysis of Large Data Sets
- Allow Comparisons with Anonymous Collective Data

PSO Requirements:

- Site Feedback / Education + Data Auditing for Quality Improvement
- Confidential Communications of PSWP, Blinding Other Sites Data
- Restrictions Non-Research / Non-Marketing of PSWP

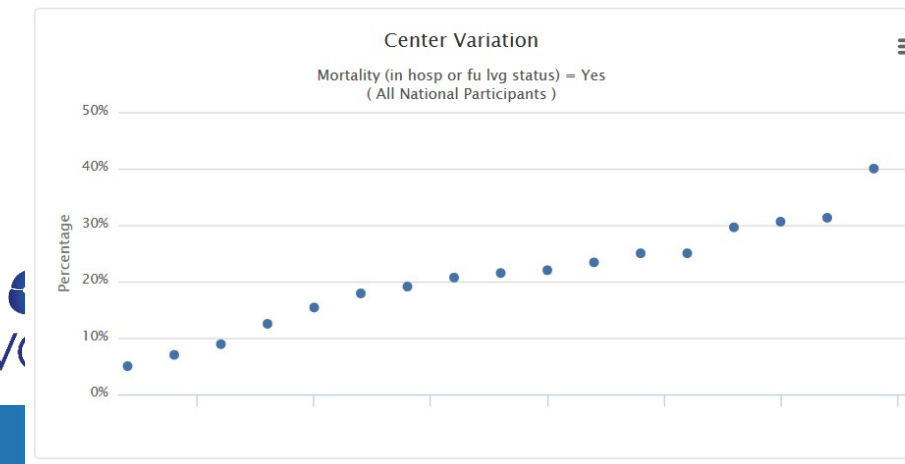
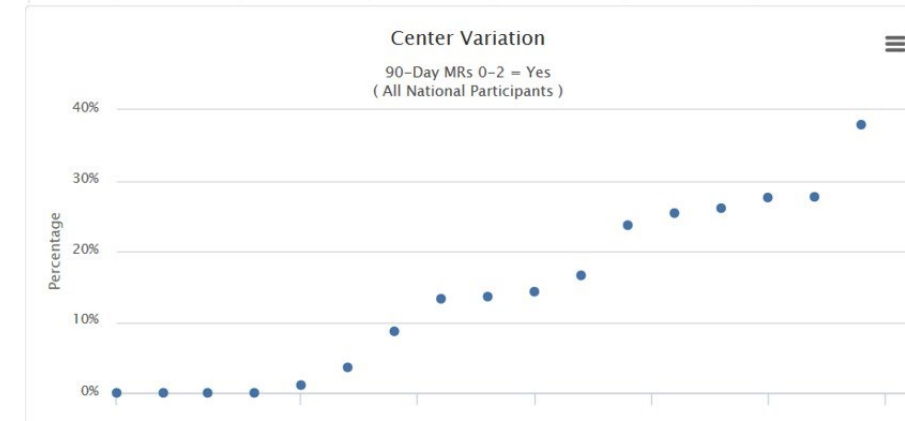
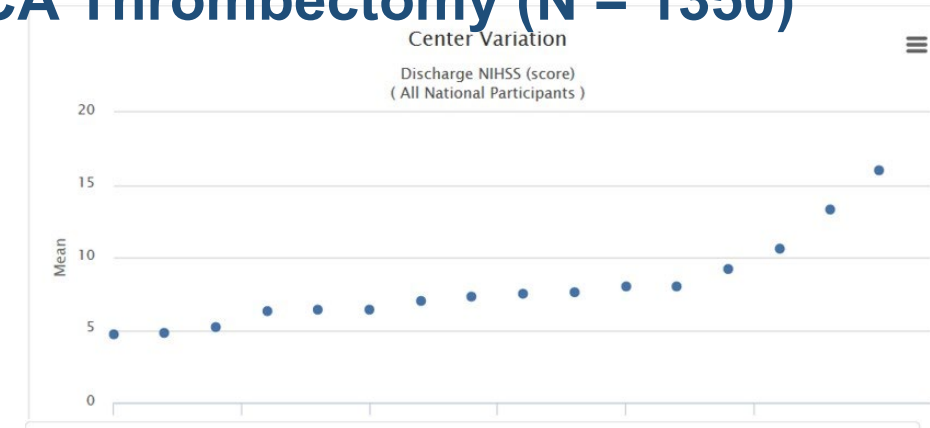
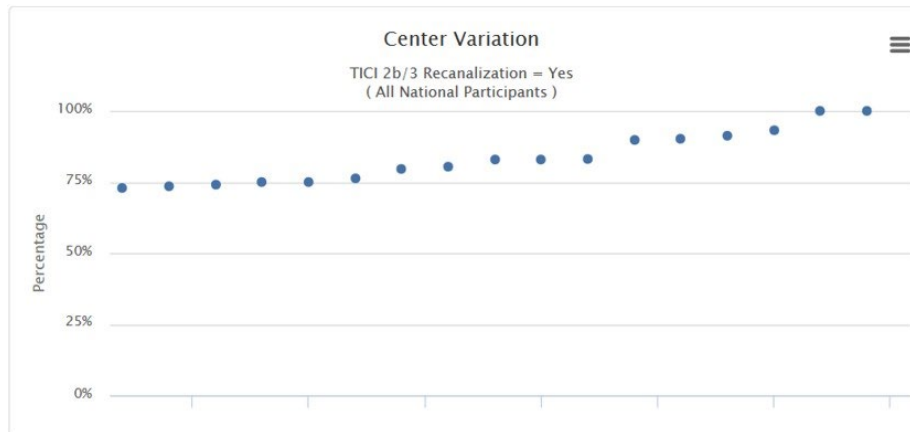
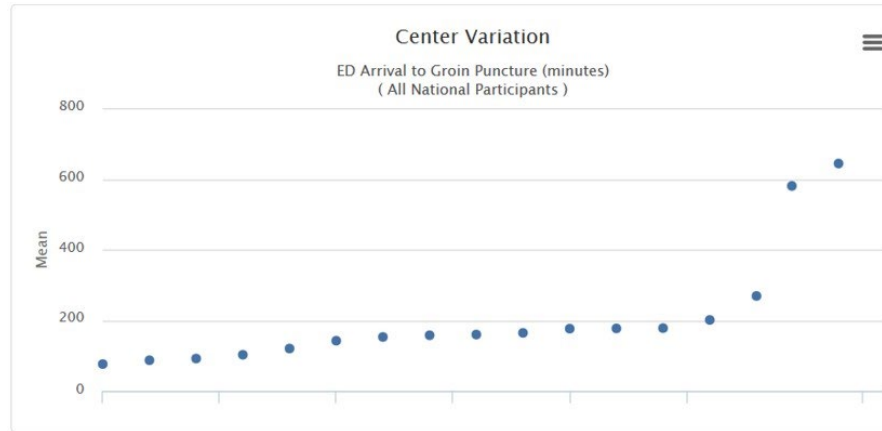
Primary Goal to Improve Patient Safety And Quality of Care

Protect Patients AND Providers



Early PSO Analysis in 2015–2018: NVQI AIS Thrombectomy Registry

Significant Center Metric Variations: ICA/MCA Thrombectomy (N = 1350)





- **1st SNIS PSO Quality Report**
 - Report Distributed April 2020
- **NVQI-QOD AIS Registry**
 - Stroke Thrombectomy Workflow Improvement

Acute Ischemic Stroke

An Analysis of Arrival to Puncture Time

In our effort to improve patient care and outcomes for patients treated with surgical/endovascular treatment of neurovascular diseases, the SNIS Patient Safety Organization (PSO) in conjunction with the NeuroPoint Alliance will provide NVQI-QOD registry data feedback, guidelines, and education in the form of dedicated quality projects and reports. Further follow-up at specific institutions may be expected to identify best practices and local quality improvement of each defined metric by the respective PSO quality committees.

Arrival to Puncture Time Analysis: The time between the patient's Emergency Department Arrival at the treating facility (or Inpatient Stroke Team Arrival) to and Access Site Puncture for a stroke thrombectomy procedure. Recommended guidelines by the SNIS (60 minutes) and AHA (90 minutes) are provided for benchmarking your institution's data.

Sources: (1) McTaggart RA, Anani SA, Goyal M, et al. J Neurointerv Surg 2017;9:316-323. (2) Powers WJ, Rabinstein AA, Ackerson T, Adegoke OA, Bambakidis NC, Becker K, Biller J, Brown M, Demerschak BA, Hoh B, Jauch EC, Kidwell CS, Leslie-Nevel TM, Ovbiagele B, Scott PA, Sheeth KN, Southerland AM, Summers DR, Tirschwell DL, on behalf of the American Heart Association Stroke Council. Guidelines for the early management of patients with acute ischemic stroke: 2019 update to the 2018 guidelines for the early management of acute ischemic stroke: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. Stroke. 2019;50:e344-e418. doi:10.1161/STR.0000000000000211. (3) Powers WJ, Derdeyn CP, Biller J, Coffey CS, Hon BL, Jauch EC, Johnston KC, Johnston SC, Khalessi AA, Kidwell CS, Meschia JF, Ovbiagele B, Yavagal DR, on behalf of the American Heart Association Stroke Council. 2015 American Heart Association/American Stroke Association focused update of the 2013 guidelines for the early management of patients with acute ischemic stroke regarding endovascular treatment: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. Stroke. 2015;46:3020-3035.

Your Center

Number of Procedures	214
Average (mins)	111
Minimum (mins)	5
Maximum (mins)	347

All NVQI-QOD

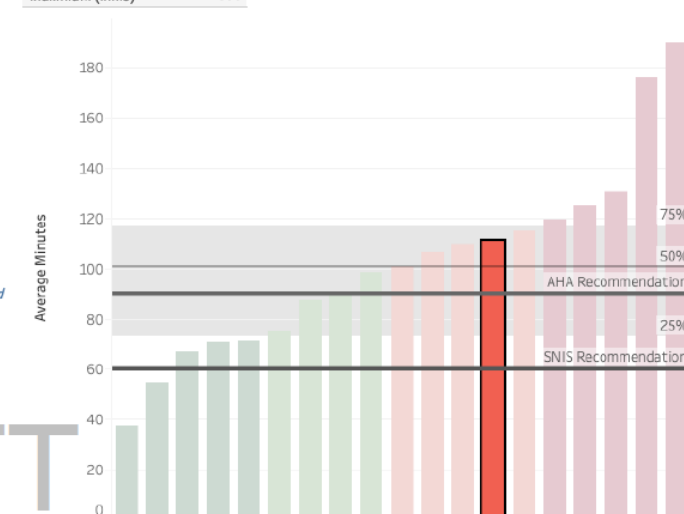
Number of Procedures	3,321
Average (mins)	90
Minimum (mins)	1
Maximum (mins)	360

DRAFT

The average time in minutes between Arrival and Puncture Time for your center is highlighted.

Procedures with a time that was blank, less than 1 minute, or more than 360 minutes have been excluded from analysis.

Number Excluded for Your Center: 13
Number Excluded for NVQI-QOD: 246



DRAFT

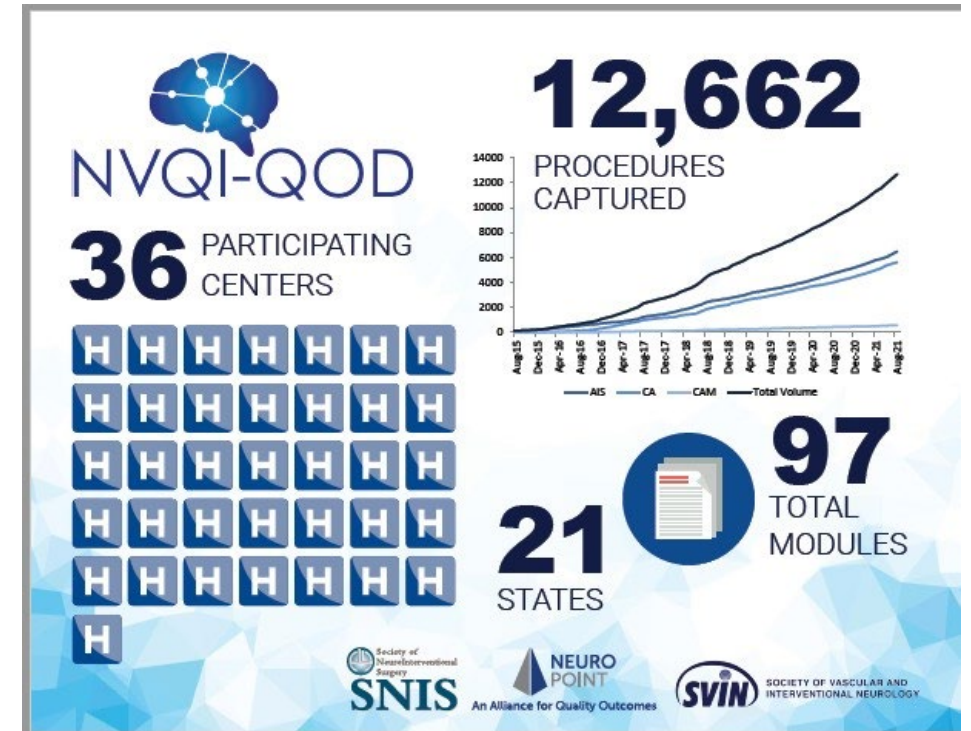
This report contains patient safety work product generated by the SNIS PSO which is considered privileged and confidential.



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NVQI-QOD 2020-2021 Update

- **Merger w/ NPA (AANS) QOD-CV Registry – 2018**
Open CV and Endovascular NI Procedures
Projected ~40 Sites in 2021 / ~200 CSCs (20%)
- **NVQI-QOD Official Registry ALL 3 Societies**
SNIS + NPA (AANS) + **SVIN** – April 2021
Expanded Governance Council
Formation of Dedicated PSO Quality Committees
- **Accumulating Volume of Data Enables →**
 - Quality** – SNIS PSO Feedback Reports, Practice Improvement + Site Education
 - Research** – Formalized Protocol with Multiple Projects / **SNIS 2020/2021 Abstracts**
 - FDA DAISI / Industry** – Device Evaluation / Expanding Indication Studies
 - CMS ? – QPP / QCDRs, APMs or Data to Support a NCD**





NVQI-QOD

Governance Council

SNIS

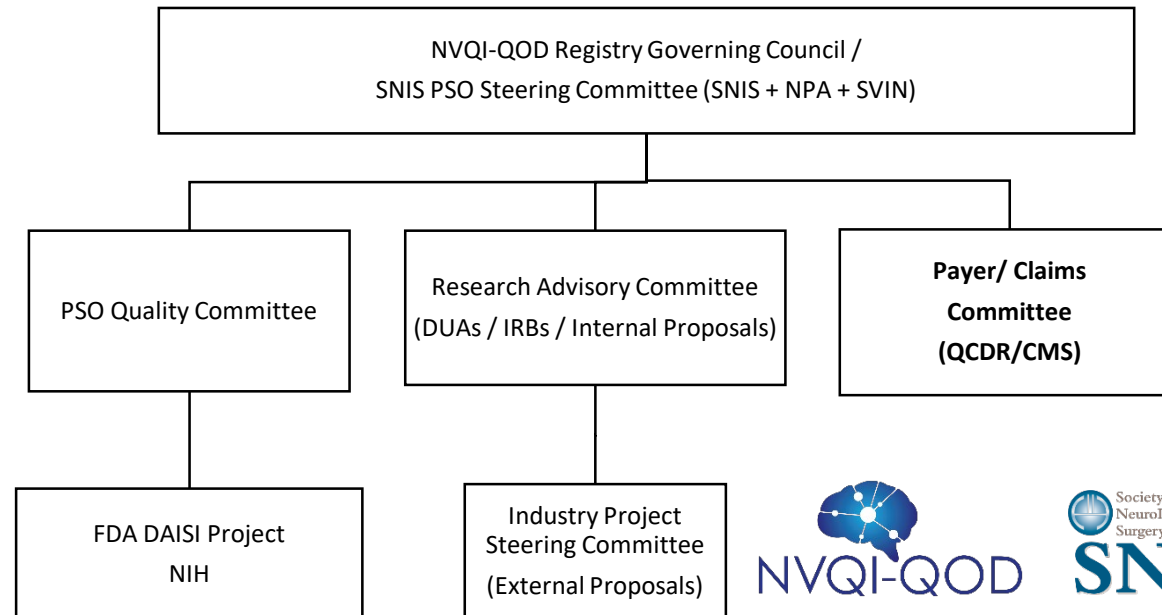
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Adnan Siddiqui, MD PhD

SVIN

David Liebeskind, MD
Ameer Hassan, MD
Sunil Sheth, MD



Available Procedure Registries for NVQI-QOD Participants

- **Acute Ischemic Stroke**
- **Hemorrhagic Stroke:**
 - Cerebral Aneurysm
 - Cerebral AVM / AVF
 - ? SDH / MMA Embo + Surgery
 - ? IPH / Surgery + Endoscopic
- Carotid Artery Stent**
- Carotid Endarterectomy**

**Provided by the Society for Vascular Surgery Vascular Quality Initiative



NVQI-QOD 2015 - Present

NVQI	<i>Procedure</i>	<i># Cases</i>	<i>Devices Included</i>
	Acute Ischemic Stroke	> 6000	Stent Retriever Devices Aspiration Devices Stent Devices
	Cerebral Aneurysm	> 5000	Clips Coils Embolization Devices Balloon/Stent Devices
	Cerebral Arteriovenous Malformation	> 300	Coils Embolic Material
VQI	<i>Procedure</i>	<i># Cases</i>	<i>Devices Included</i>
	Carotid Endarterectomy	> 120, 000	Patch Type
	Carotid Artery Stent	> 30, 000	Stent, Protection Device Type

NVQI–QOD Acute Ischemic Stroke (Thrombectomy) Registry



Potential QCDR Measures for CMS Submission: NVQI-QOD Acute Ischemic Stroke Thrombectomy Registry

- **Stroke Intervention Processes, Time and Technique:**
ED Arrival to IV tPA / IA Puncture and Reperfusion Times (Procedure Times)
Successful (TICI >2b) or Complete (TICI 2c-3) Reperfusion Grade
Median Thrombectomy Passes / % Single Pass Recanalization
- **Primary Clinical Outcomes:**
90 day Functional Independence (mRS 0-2), Mortality (mRS 6)
- **Secondary Clinical Outcomes:**
Early Neurological Improvement (24h NIHSS or \downarrow NIHSS ≥ 8 or 0-1 at 24-72h)
Discharge NIHSS,
- **Complications:** Symptomatic ICH (\uparrow NIHSS ≥ 4) – Early Reperfusion or Delayed Infarct Transformation
Vascular Injury (Perforations, Dissections), Residual Emboli (NTE/DTE), Access Site Complications
- **Risk or Population Adjusters:**
Symptom Onset to Arrival Time, Age, Presenting NIHSS, Comorbidities/Risk Factors, LVO Sites
Imaging Selection: CT ASPECTS, CTP, MR DWI-PWI (Core Infarct Volumes)



Real World Evidence and Practice Improvement of Acute Stroke Thrombectomy in the United States from the NVQI-QOD Registry

*Y Moazeni, RN Abdalla, DR Cantrell, MB Potts, BS Jahromi, A Shaibani, SA Ansari
Northwestern University on behalf of the NVQI-QOD Investigators*



Introduction

- Multiple RCTs Demonstrated Clinical Benefit Of Endovascular Stroke Thrombectomy In Anterior Circulation LVOs < 6 Hours
2015
- HERMES Meta-Analysis Established NNT 2.6 for Endovascular Thrombectomy To Reduce Disability > 1 on mRS
- DAWN/DEFUSE-3 Trials Extended the Benefit to < 24 Hours w/ Advanced Imaging Selection
2018

Aim

- Present Real-World Evidence For Endovascular Thrombectomy (EVT) in the United States using the Neurovascular Quality Initiative (NVQI) Registry in Comparison to RCT Data/HERMES
- Assess Interval Stroke Thrombectomy Practice Improvement in Quality and Outcome Metrics After DAWN/DEFUSE3 RCT
2015 – 2017 vs 2018 – 2020 (March pre-COVID)

Methods AND Results

- Analyzed Data from NVQI-QOD registry between Jan 2015 – Mar 2020
- 2936 patients from 23 US Centers (17 states)
- Fisher's exact and Mann-Whitney U tests were used to compare categorical and continuous variables, respectively.
- IBM SPSS Statistics, version 23 (IBM Corp., Armonk, N.Y., USA)
Statistical significance $p \text{ value} \leq 0.05$

Methods AND Results

Demographics:

- 49.3% Males (n=1449)
- Mean Age 68.9 (+/-14.8), Median 71
- **91.2% (2936/3218) Anterior Circulation Occlusions**
- LVO Locations: MCA (74.6% including 19.1% M2)
ICA (24.8% including 13.8% Cervical ICA)
ACA (0.6%)

Presentations:

- Mean Presenting NIHSS 15.8 (+/-6.8), Median 16
- 41.9% of patients received IV rtPA.

Methods AND Results

Imaging Selection:

- CT/CTA **93.4%**
- Advanced Tissue Imaging MRI/MRP/CTP **52.6%**
- ASPECTS ≥ 7 **81.2%** vs **18.7% ASPECTS < 7** (Reported 68.7%)

Time Metrics:

- Median LKW/Onset To 1st ED Arrival = \uparrow 107 Min (**vs 96 Min in 2018**)
- Median Arrival To Groin Puncture Time = \downarrow 82 Min (**vs 113 Min in 2018**)
- Median Procedure Time = \downarrow 35 Min (**vs 50 Min in 2018**)

Methods AND Results

Technical Outcomes / Complications

- Successfully TICI 2b/3 Reperfusion **87%** / Complete Reperfusion 49.4%
- First Pass Successful Recanalization 41%
- Technical Failures 6.2% (1.6% Access Related)
- Intra-Procedural Complications 5.4%
 - 0.4% Vessel Perforations
 - 0.6% Early Hemorrhagic Transformation / 0.8% SAH ??**
 - 1.5% Non-target Embolization
 - 1.4% Iatrogenic Dissections

Methods AND Results

Clinical Outcomes / Safety

- Symptomatic Intracranial Hemorrhage (sICH) – Reported After 2020
- Mean Post-Operative Length of Stay 8.5+/-11.1 days, Median 6 days
- In-hospital Mortality 11.1%
- **90-day Mortality (mRS 6) 21.4%** (↑ vs 17.5% in 2018)
BUT Follow-up Reported in 65.4% of All Cases (↓ vs 72.5% in 2018)
- **90-day Follow-up mRS**
Favorable Clinical Outcomes (mRS≤2) 39.1% (vs 41.9% in 2018)
BUT mRS Reported in 43.4% of All Cases (↓ vs 44.2% in 2018)

NVQI-QOD vs HERMES

	NVQI-QOD (n=2936)	HERMES (n=634)	P-Value
Age (Median (min-max))	↑71 (18-90)	68 (57-77)	
Male (%)	49.3	52	
NIHSS (Median (min-max))	16 (0-37)	17 (14-20)	
Anterior Circulation (%)		100	0.03
MCA	74.6	77	
ICA	24.7	21	
ACA/Other	0.6	2	
ASPECTS ≥7 (%)	↓81.2	97.8	< 0.00001
IV rtPA (%)	↓41.9	83	< 0.00001
Successful Recanalization (%)	↑87	71	< 0.00001
90 day mRS score 0-2 (%)	↓39.1 (mRS Available in 1274)	46	< 0.00001
90 day Mortality	↑21.4 (F/U Available in 1923)	15.3	< 0.0009



NVQI-QOD vs HERMES

- **Real World Evidence for Stroke Thrombectomy vs HERMES:
DESPITE**

- ↑ Patient Age
- ↓ IV tPA Utilization
- ↑ Treatment of ASPECTS < 7 / Larger Infarcts? ~ 20%
- ↓ CTP or MR DWI/PWI ~ 50%
- ↑ Treatment of Late Time Windows ~ 40% > 6 hours

RESULTS

- ↑ **Successful Reperfusion / Devices and Experience?**
- ↑ **Mortality 21.4 vs 15.3% (BUT = MR CLEAN 21%)**
- ↓ **Favorable Clinical Outcomes (mRS 0-2) 39% vs 46% (Still > MR CLEAN 32%)**
BUT Treating/Benefit of Larger Population “Denominator Effect”

2015-2017 vs 2018-2020 Stroke Thrombectomy

Variable	2015-2017 N= 1153	2018-2020 N= 1783	p-value	All participants N=2936
Male (%)	50 %	49 %	0.62	49.3
Age (Median, (min-max))	69 (18-90)	71 (18-90)	0.001	71 (18-90)
IV tPA given (%)	46.7	38.7	<0.001	41.8
Risk factors				
CAD (%)	16	19.3	0.05	18
CHF (%)	14.4	16.6	0.23	15.7
DM (%)	27.9	26.9	0.44	27.3
HTN (%)	71.8	75.8	0.01	74.2
Smoker (%)	21.6	21.6	0.78	21.6
Afib (%)	33.8	38	0.03	36.4
Previous stroke (%)	19.8	19.4	0.70	19.6
Transfer	49.6	46.3	0.06	47.6
NIHSS (Median, (min-max))	16 (0-33)	16 (0-37)	0.72	16 (0-37)
ASPECTS (Median, (min-max))	9 (0-10)	9 (0-10)	0.33	9 (0-10)
Location of occlusion (%)			0.001	
Cervical ICA	15	13		13.7
Intracranial ICA	12.6	10		11
ACA	1	0.3		0.6
MCA	71.4	76.7		74.6

2015-2017 vs 2018-2020 Stroke Thrombectomy

Variable	2015-2017 N= 1153	2018-2020 N= 1783	p-value	All participants N=2936
Time metrics, minute (Median, (min-max))				
LKW to ED arrival	96.5 (0-1376)	112.5 (0-1439)	0.005	107 (1439)
LKW-to-groin puncture	277.5 (30-1427)	290 (27-1428)	0.32	285.5 (27-1428)
LKW-to-groin puncture > 6 hours N (%)	392 (35.4)	691 (40.6)	0.006	1083 (38.6)
ED-to-IV tPA	40 (0-90)	40 (0-90)	0.46	39 (0-90)
ED-to-groin puncture ^b	90 (10-1487)	71 (10-1485)	<0.001	82 (10-1487)
Procedure time	38 (3-1481)	32 (4-699)	<0.001	35 (3-1481)
Reperfusion rate (%)				
Successful reperfusion	85.2	88.2	0.01	87
Complete reperfusion	45.8%	51.8%	0.002	49.4
Single pass reperfusion	457 (39.6)	728 (40.8)	0.53	1185 (40.3)
Clinical Outcomes				
mRS 0-2 at 90 days N (%)	214 (41.9)	285 (37.3)	0.23	499 (39.1)
mRS 6 at 90 days (total mortality) N(%)	147 (17.5)	264 (24.3)	0.03	411 (21.4)
Reported mRS at 90 days N (%)	510 (44.2)	764 (42.8)	<0.001	1274 (43.4)
Follow up population N (%)	837 (72.5)	1086 (60.9)	<0.001	1923 (65.4)

NVQI-QOD 2015-2017 vs 2018-2020

- **Interval Practice Improvement (After 2018→ DAWN/DEFUSE3 RCTs):**

- Inclusion of Larger Populations Being Offered Thrombectomy**

- ↑ Patient Age / Comorbidities (CAD, HTN, Afib)

- ↑ Treatment Extended Interventional Windows > 6-24 hours / DAWN-DEFUSE3

- ↓ IV tPA Utilization

- Improved Stroke Thrombectomy Process-Workflow and Technical Efficacy**

- ↓ Arrival to Puncture + Procedure Times

- ↑ Successful + Complete Reperfusion / Devices and Experience?

- No Significant Change in Favorable Clinical Outcomes (mRS 0-2) 37.3 vs 41.9%**

- Modest ↑ Mortality 24.3 vs 17.5% (Acceptable Range)**

- Expanding Treatment Population/Benefit Over Time**

Limitations of Registry Data

- **Most Common Missing Data Elements / Unreported:**
Symptomatic ICH (Added > 2020 Registry Update)
Intra-Procedural Complications 13%
ASPECTS 31.3% / Advanced MR DWI-CTP Imaging Data
Patients Lost to Follow-up 34.5% → **Missing/Unreported 90-day mRS 66.6%**
- **Self-Reporting Bias / Non-Adjudicated Data**
- **?Solutions:** → Inherent Statistical Power of Large Registry Sample Sizes ?
→ Leverage EMRs / PACS Imaging Automated Data Capture
→ AI Based Adjudication
→ CMS Projects with Incentivized Payment for Data Capture in NCD
→ Quality/Value Based Reimbursement Models via QCDRs
(QPP/MIPS or APMs)



Conclusions

- **Stroke Thrombectomy Practices, Procedural Metrics, Outcomes from NVQI-QOD Registry Parallels the HERMES Meta-Analysis of RCT Data Despite Higher Risk Population →**
Confirms Real-World Practice And Evidence For EVT in the United States
- **Expanding Treatment Population: ↑Age/Comorbidities, ↓IV tPA, ↓ASPECTS (Larger Core Infarcts), ↑ Time Windows for Intervention (After DAWN/DEFUSE3 Trials) →**
Improved Care (Experience/Technology) with ↑ Successful/Complete Reperfusion Rates
Marked Interval Stroke Process Improvement/Times from 2015-2017 to 2018-2020
Maintaining Favorable ~40% Clinical Outcomes with Modest ↑ Mortality Rates
- **Future Stricter Quality Reporting Guidelines, Improved Follow-Up, Payor Incentives EMR Integration and Automated Data / Imaging Adjudication →**
Quality Reporting Registries May be Leveraged:
Clinical Practice Improvement and Research – Embedded Clinical Trials
Regulatory Device Monitoring / Expanding Indications
Value-Based Reimbursements / Risk Adjusted Outcomes in QPP/ APM / NCD Models



Thank you !

