Knowledge Generated from Patient-Level Data Submitted by over 700 TAVR Sites and now over 300,000 Patients Who have Been Treated from 2011-2020 in the US.

A Major Goal of TVT Registry: Improving the Quality of Patient Care
<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 PM ET</td>
<td><strong>Introduction</strong></td>
<td><strong>Dr. John Carroll</strong>&lt;br&gt;MD, FACC, Chair, STS/ACC TVT Registry Steering Committee, Professor of Medicine/Director of Interventional Cardiology, University of Colorado</td>
</tr>
<tr>
<td></td>
<td><strong>Dr. Vinod Thourani</strong>&lt;br&gt;MD, FACC, Co-chair STS/ACC TVT Registry Steering Committee, Bernie Marcus Chairman, Department of Cardiovascular Surgery, Marcus Heart Valve Center, Piedmont Heart Institute, Atlanta GA</td>
<td></td>
</tr>
<tr>
<td>1:05</td>
<td>Public Reporting: Overview and Specifics of the STS-ACC TVT Registry Public Reporting Process</td>
<td><strong>Dr. Ralph Brindis</strong>&lt;br&gt;MD, MPH, MACC, Chair of the STS/ACC TVT Registry Public Reporting Workgroup; Clinical Professor of Medicine Department of Medicine and Philip R. Lee Institute for Health Policy Studies, UCSF and Senior Medical Officer, external affairs, NCDR</td>
</tr>
<tr>
<td>1:20</td>
<td>Methodology to be used by TVT Registry for Public Reporting</td>
<td><strong>Dr. Nimesh Desai</strong>&lt;br&gt;MD, PhD, Chair, STS/ACC TVT Registry Risk Model Workgroup; Co-Director, Thoracic Aortic Surgery Program and Associate Professor in the Division of Cardiovascular Surgery at the Hospital of the University of Pennsylvania</td>
</tr>
<tr>
<td>1:35</td>
<td>Methodology used by US News &amp; World Report for Public Reporting</td>
<td><strong>Ben Harder</strong>&lt;br&gt;Chief of Health Analysis and Managing Editor, U.S. News &amp; World Report&lt;br&gt;<strong>Tavia Binger</strong>&lt;br&gt;MSPH, Senior Health Data Analyst, U.S. News &amp; World Report</td>
</tr>
<tr>
<td>2:00</td>
<td>Comparisons of Methodology and Experience in Public Reporting from the Society of Thoracic Surgeons</td>
<td><strong>Dr. David Shahian</strong>&lt;br&gt;MD, FACC, Co-Chair, STS/ACC TVT Registry Public Reporting Workgroup, Professor of Surgery, Harvard Medical School; Vice President, Center for Quality and Safety at Massachusetts General Hospital</td>
</tr>
<tr>
<td>2:15</td>
<td>Questions and Discussions</td>
<td><strong>Dr. David Cohen</strong>&lt;br&gt;MD, MSc, Co-Chair STS/ACC TVT Registry Risk Model Workgroup, University of Missouri-Kansas City</td>
</tr>
</tbody>
</table>
When the Public Wants to Know: Public Outcomes Reporting

Ralph Brindis, MD, MPH, MACC, FSCAI, FAHA
Clinical Professor of Medicine, UCSF
Dept. of Medicine & the Philip R. Lee Institute for Health Policy Studies
Senior Medical Officer, External Affairs, ACC National Cardiovascular Data Registry
November 2020
Public Reporting in Medicine is Not New

The train has left the station, and it ain’t coming back

And . . . The public has increasing expectations
Outside Third Party Assessors
Alternative Facts??? (Fake News?)

What do we Want?
EVIDENCE BASED SCIENCE
When do we Want It?
AFTER PEER REVIEW
Want to Buy a Refrigerator?

5.1 Million results
Need Advice on Hotels or a Plumber?
What About a Doctor or Hospital?

Google search for "physician ratings 2015"
- About 5,340,000 results (0.37 seconds)

Google search for "hospital ratings 2015"
- About 88,000,000 results (0.22 seconds)
Why Should You Care About Public Reporting?

Are choices about your healthcare equal in importance to your choice of airlines, schools, hotels, refrigerators and plumbers?

Should the consumer, have access to information about the quality of healthcare facilities and providers?
The Status of Public Reporting

1. There is an explosion of activity in many different directions
2. It draws a large crowd
3. Some think it’s beautiful
4. Some think it’s very scary
5. You can get hurt if not used properly
Public Reporting: Benefits to Patient Care

• Public Reporting of data encourages:
  – Transparency of outcomes
  – Attention to quality metrics by hospitals and physicians
  – Contributions to national data registries
  – Adjustments of techniques to improve results
  – Increased choice by consumers -more shared decision making

• Public reporting is becoming more widespread
  – Physicians/patients should be aware of publicly available reports
  – Physicians should be prepared to review reports as patients ask questions
  – Physicians should be prepared to share their own outcomes
ACC Public Reporting Mission Statement

• Monitor the quality of CV patient care being provided in a transparent manner.
• Ensure reporting is based on high quality data, is administered with minimal collection burden employing clinically valid & methodologically sound measures.
• Provide measures that are actionable and consistent with the Triple Aim without causing unintended consequences in access to care.
• Foster relationships of trust through collaboration between patients and their CV care team with information that is credible, understandable, and actionable.
• Enable patients and CV professionals to advocate for policies at the federal and state level that support achieving the Triple Aim.
• This mission in providing open access to information on quality of care is championed as an ethical responsibility of the profession.
<table>
<thead>
<tr>
<th>Category</th>
<th>Websites/Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal Government</td>
<td>Hospital Compare, Physician Compare, Payments to physicians</td>
</tr>
<tr>
<td>State Government</td>
<td>State Public Reporting Programs, MA, NY, PA, CA, TX, others</td>
</tr>
<tr>
<td>Independent Groups</td>
<td>HealthGrades, ProPublica, USNWR, Truven, Leapfrog, Consumer Reports, Others ...</td>
</tr>
<tr>
<td>Insurance Providers</td>
<td>Aetna, BCBS, Others, but you don’t know it</td>
</tr>
<tr>
<td>Consumer Websites</td>
<td>RateMD.com, Angie’s List, Yelp, Others . . .</td>
</tr>
</tbody>
</table>
Inconsistencies in Reporting and Ratings of Hospitals

Healthcare Association of New York State
Grading the Graders

http://www.hanys.org/quality/data/report_cards/2013/

• Transparent methodology
• Evidence-based measures
• Measure alignment
• Appropriate data source
• Current data
• Risk-adjusted data
• Data quality
• Consistent data
• Hospital preview
CONCLUSIONS

• Compared 4 national rating systems
  USNWR, HealthGrades, Leapfrog, Consumer’s Reports
• Designated “high” and “low” performers and examined ratings overlap
• No hospital was rated a high performer in all 4 rating systems
• Only 10% of the 844 hospitals rated as a “high performer” in one rating system were rated as a high performer by any other rating system
Why Are There Inconsistencies?

Administrative Data

1. “Claims” data are derived from reimbursement information (bills) sent to Medicare
2. Contains: Demographic data, admission/discharge, diagnoses, procedures, date of death, . . .
3. Linkage to other external datasets: US census, cancer registries, national death index, etc . . .
4. Available, inexpensive

Limitations

1. Co-existing diseases (HBP, diabetes) underdiagnosed and missed
2. Limited diagnosis codes - - - improved by ICD-10
3. Limited clinical information
4. Many services excluded
5. Delayed reporting
6. Medicare FFS only
Clinical Data (NCDR, STS)

1. Derived from clinical registries (STS, NCDR, . . .)
2. Comprehensive
3. Contains extensive clinical data
4. Composite data available
5. Risk adjustment more robust

**Limitations**

1. Labor intensive to collect
2. Costly
3. Audited, but only a modest percentage of records.
4. Still may lack some data elements that can effect clinical outcomes (inadequate risk-adjustment)
A Need for Caution - - The Bad *(Ugly)*

Even something that seems innocent and well-intentioned can have negative consequences.
Unintended Consequences: Less PCI for Acute MI

There has been a decrease in the proportion of AMI patients treated with PCI in MA versus other states.

This trend was associated with increased mortality in STEMI patients (p=0.004)

Joynt K. et al. JAMA 2012;308(14) 1460-1468.
Pressured to avoid PCI – 59%
Avoided PCI out of outcomes concerns- 38%
Perceive PCI avoidance of other MDs- 66%
What extent upcoding comorbidities occur- 63%

Responses from 149 interventional cardiologists in Mass. & New York

Blumenthal et.al., JAMA Cardiol 2018
PCI Risk Adjustment Models Only Fit the Data Collected

What About?
• Down Time
• Initial Rhythm
• Bystander CPR
• Aortic Stenosis
• CABG/SVG Intervention
• Surgery Refusal
• Ongoing Bleeding
• Prior/Recent Stroke
• Stent Thrombosis
• PAD
• Multivessel Disease
• Proximal LAD Infarct

Straight Forward Cases??
• MI Post ERCP-Thrombotic Occluded RCA
  • Successful PCI
  • Developed post ERCP-pancreatitis
  • Ranson Criteria Predicted 100% death at 48 hrs

• MI preop Biliary Cancer-”Do Everything”, Withdrawal of Care HD #2 for Obstructive Liver failure, No longer surgical

• Post Infarction VSD. Diagnosed in lab. PTCA alone RCA. Refused by Surgery. Died 5 days after VSD occluder placed

• Liver Laceration from CPR Recognized 2 hours after successful PCI for Stent Thrombosis. Surgeons Unable to stop bleeding
Physician vs Patient Perceptions

While MD’s remain concerned….
patient perceptions of public report value stand in stark contrast.

Patient vs. Physician Perceptions

Source: Fernandez G et al. Circ CV Qual Outcomes 2017
Does Public Reporting Work?

Wisconsin Collaborative for Healthcare Quality
20 physician groups; 582 affiliated clinics – voluntary reporting
14 metrics: diabetes care, CAD, uncomplicated hypertension and screening or preventative measures

Findings:
1) Improved performance in most metrics during public reporting
2) Physician groups motivated by public reporting
ACC’s Heart a Home campaign for patients & their families

- Public can look up hospital information on ACC’s consumer website CardioSmart.org
- All NCDR hospitals receive a profile page to promote CV services
- Information is managed by hospitals

http://FindYourHeartAHome.org
General Hospital data
- Map/address/directions
- Website/Phone
- Cardiac Services

ACC programs
- Registries
- Public Reporting status
- Other Programs: QII, CP-MI, Performance Award

Metrics (if opt-in)
- Procedure volume
- NQF endorsed metrics initially utilized and now expanded beyond that scope

Unique profile for every NCDR hospital
- Bookmark or download .pdf
- Sites can use in marketing

Cardiology World, LLC
Address
30 Hampton Blvd NE
Chesapeake, VA 23324
Get Directions
Website
www.cardiologyworld.com
Phone Number
703-555-1212

Cardiac Services
- Acute Myocardial Infarction Treatment
- Cardiac Defibrillator Implantation
- Carotid Artery Stenting
- Carotid Endarterectomy
- Congenital Heart Defect Intervention
- Diagnostic Cardiac Catheterization
- Electrophysiology Studies
- Pacemaker Implantation
- Percutaneous Coronary Intervention
- Transcatheter Valve Replacement

Cardiac data registries are national databases that collect information on specific heart conditions or procedures performed in hospitals. Quality improvement programs give hospitals the tools and resources they need to improve how they deliver care.

Hospital Profile

Registry and Quality Program Participation
Hospital’s participation in American College of Cardiology's data registries and the Quality Improvement for Institutions program.

CathPCI Registry®
Assoc Services: Diagnostic Cardiac Catheterization, Percutaneous Coronary Intervention for Elective and Emergency Cases & Percutaneous Coronary Intervention for Acute Myocardial Infarction
Participating

CathPCI Public Reporting Status
Ineligible: Not Participating

ICD Registry™
Assoc Services: Electrophysiology Studies, Pacemaker Implantation & Cardiac Defibrillator Implantation
Not Participating

ICD Public Reporting Status
Participating with ACC

Chest Pain - MI Registry™
Assoc Services: Acute Myocardial Infarction Treatment
Participating

Chest Pain - MI Public Reporting Status
Participating with ACC

Chest Pain - MI Registry™ Performance Achievement Award Recipient
Silver

AFib Ablation Registry™
Assoc Services: Atrial fibrillation ablation
Not Participating

IMPACT Registry®
Assoc Services: Congenital Heart Defect Intervention
Not Participating

LAAC Registry™
Assoc Services: Left atrial appendage occlusion
Participating

PVI Registry™
Assoc Services: Percutaneous Peripheral Vascular Intervention, Carotid Artery Stenting & Carotid Endarterectomy
Not Participating

STS/ACC TVT Registry™
Assoc Services: Transcatheter Valve Replacement
Participating

Quality Improvement for Institutions Program
Participating

STS National Database
### Star Scores

#### Implantable Cardiac Defibrillator Metrics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of initial ICD implant procedures performed</td>
<td>474</td>
</tr>
<tr>
<td>Proportion of patients with left ventricular systolic dysfunction who had ACE-I or ARB prescription addressed on discharge</td>
<td>⭐⭐⭐⭐⭐ ⚫</td>
</tr>
<tr>
<td>Proportion of patients with prior MI who had beta-blocker prescription addressed on discharge</td>
<td>⭐⭐⭐⭐⭐ ⚫</td>
</tr>
<tr>
<td>Proportion of patients with left ventricular systolic dysfunction (LVSD) who had beta-blocker prescription addressed on discharge</td>
<td>⭐⭐⭐⭐⭐ ⚫</td>
</tr>
<tr>
<td>Composite: Proportion of patients prescribed all discharge medications (ACE-I/ARB and/or beta-blocker) for which they were eligible</td>
<td>⭐⭐⭐⭐⭐ ⚫</td>
</tr>
</tbody>
</table>

#### Diagnostic Catheterization and Percutaneous Coronary Intervention Metrics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of PCI/angioplasty procedures performed during the calendar year</td>
<td>1468</td>
</tr>
<tr>
<td>Use of Aspirin to reduce the chance of blood clots after PCI/angioplasty</td>
<td>⭐⭐⭐⭐⭐ ⚫</td>
</tr>
<tr>
<td>Use of a P2Y12 inhibitor medication to reduce the chance of blood clots after PCI/angioplasty</td>
<td>⭐⭐⭐⭐⭐ ⚫</td>
</tr>
<tr>
<td>Use of a Statin to decrease cholesterol after PCI/angioplasty</td>
<td>⭐⭐⭐⭐⭐ ⚫</td>
</tr>
<tr>
<td>Use of all recommended medications (Aspirin, P2Y12 inhibitor medication, and Statin) to reduce the chance of blood clots and decrease cholesterol after PCI/angioplasty</td>
<td>⭐⭐⭐⭐⭐ ⚫</td>
</tr>
</tbody>
</table>

#### Acute Myocardial Infarction (AMI) Metrics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of acute myocardial infarctions (MIs) treated during the calendar year</td>
<td>416</td>
</tr>
<tr>
<td>All Heart Attack Care</td>
<td>⭐⭐⭐⭐⭐ ⚫</td>
</tr>
<tr>
<td>Urgent Heart Attack Care</td>
<td>⭐⭐⭐⭐⭐ ⚫</td>
</tr>
</tbody>
</table>
Public Reporting Status May 2020

- **Total Unique Sites**: 768
  - **CathPCI** (45%): 754
  - **ICD** (31.72%): 282
  - **CPMI** (18.60%): 138

Monthly Site Enrollment

Legend:
- Total Unique Sites
- CathPCI
- CPMI
- ICD
- 1st Year Total Site Goal
- 2nd Year Total Site Goal

Note: CathPCI 44.54% of Registry sites have opted in.

ICD 31.72% of Registry sites opted in.

CPMI 18.60% of Registry sites opted in.

---

STS National Database

NCDR
NATIONAL CARDIOVASCULAR DATA REGISTRY
ACC’s Voluntary Public Reporting is Recognized by Key Stakeholders


https://www.bcbs.com/blue-distinction-specialty-care; Cardiac Care Provider Survey
<table>
<thead>
<tr>
<th>Timeframe First TAVR Procedure Performed</th>
<th>My Hospital TAVR Volume (commercial procedures only)</th>
<th>Distribution of Annual Hospital Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>December, 2011</td>
<td>750</td>
<td>60</td>
</tr>
</tbody>
</table>

My Hospital TAVR 30 Day Composite\(^1\,^2\) (95% Interval) | Eligible Patients (Jan 1, 2017 - Dec 31, 2019) | Participant Rating | Distribution of Participant Estimates |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05 (-0.15 to 0.12)</td>
<td>160</td>
<td>★★</td>
<td>-0.2 -0.1 0 0.1 0.2</td>
</tr>
</tbody>
</table>

\(^1\) 30 Day Composite consists of six ordered categories based on the worst possible outcome (30-day death) to the best possible outcome (e.g. alive and free of major complications) during hospitalization and the 30-day follow-up period as defined below:

1. 30-day death
2. 30-day stroke
3. 30-day life-threatening/major bleed
4. Acute kidney injury (stage III)
5. 30-day >=2+ (mod-sev) paravalvular leak
6. None of the above

\(^2\) The TAVR 30-day Mortality/morbidity composite is reported as a “win difference”

>0 implies “My Hospital” has better than expected performance

<0 implies “My Hospital” has worse than expected performance
### TAVR 30-Day Composite

<table>
<thead>
<tr>
<th>Number of Eligible</th>
<th>TAVR 30-DAY Composite Win Difference (Site Benefit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>Estimate</td>
</tr>
<tr>
<td>160</td>
<td>0.05</td>
</tr>
</tbody>
</table>

### TAVR 30-Day Composite Details

+ Number of patients with observed outcome in each composite outcome category

<table>
<thead>
<tr>
<th>Composite Outcome Category</th>
<th>My Hospital</th>
<th>Registry</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Worst Observed Outcome)</td>
<td>Number</td>
<td>Percent</td>
</tr>
<tr>
<td>Death (30 day)</td>
<td>4</td>
<td>2.5%</td>
</tr>
<tr>
<td>Stroke (30 day)</td>
<td>1</td>
<td>0.6%</td>
</tr>
<tr>
<td>Life threatening/major bleeding (30 day)</td>
<td>8</td>
<td>5.0%</td>
</tr>
<tr>
<td>Acute kidney injury (in-hospital AKI stage III or 30 day new dialysis)</td>
<td>2</td>
<td>1.3%</td>
</tr>
<tr>
<td>&gt;=2+ (mod-sev) paravalvular leak (30 days)</td>
<td>4</td>
<td>2.5%</td>
</tr>
<tr>
<td>None of the above</td>
<td>141</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

### Comparison of observed and expected outcome for cumulative outcome categories

<table>
<thead>
<tr>
<th>Composite Cumulative Outcomes</th>
<th>Obs (%)</th>
<th>Exp (%)</th>
<th>O / E Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death</td>
<td>x.x%</td>
<td>x.x%</td>
<td>xx.x (xx.x - xx.x)</td>
</tr>
<tr>
<td>Death or Stroke</td>
<td>x.x%</td>
<td>x.x%</td>
<td>xx.x (xx.x - xx.x)</td>
</tr>
<tr>
<td>Death or Stroke or Bleeding</td>
<td>x.x%</td>
<td>x.x%</td>
<td>xx.x (xx.x - xx.x)</td>
</tr>
<tr>
<td>Death or Stroke or Bleeding or AKI</td>
<td>x.x%</td>
<td>x.x%</td>
<td>xx.x (xx.x - xx.x)</td>
</tr>
<tr>
<td>Death or Stroke or Bleeding or AKI or PVL</td>
<td>x.x%</td>
<td>x.x%</td>
<td>xx.x (xx.x - xx.x)</td>
</tr>
</tbody>
</table>
Hospitals have a preview period before star-ratings are made public

- Hospital-specific support for public reporting also available on Quality Improvement for Institutions
- Specific publicly reported measures and methodology
- Opt-in form available for download for each public reporting registry program

http://cvquality.acc.org
Tentative Plan: TVT Registry Public Reporting

• 2020Q4: Sites preview their PR metrics with Jan 1, 2017- Dec 31, 2019 data
• 2021Q1: Sites consent (opt in) to voluntary PR
  – Opening and closing dates for consenting TBD (January- March)
  – Sites consent through the NCDR consenting process
  – Sites can opt out of Public Reporting at any time
• 2021q2 (date TBD) – Composite model available on Registry dashboard with data covering January 1, 2018-December 31, 2020 (and updated quarterly)
• 2021q3 – TVT Registry Public Reporting metrics launched to public (for consenting sites only)
### STS/ACC TVT Registry

#### Public Reporting Metrics

Patients with TAVR as of 2019 q4

Hospital ABC (123456)

<table>
<thead>
<tr>
<th>Timeframe First TAVR Procedure Performed</th>
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<th>Distribution of Annual Hospital Volume</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Cumulative</td>
<td>Average annual volume (Jan 1 2017 to Dec 31, 2019)</td>
</tr>
<tr>
<td>December, 2011</td>
<td>750</td>
<td>60</td>
</tr>
</tbody>
</table>

![Distribution Diagram](image)

<table>
<thead>
<tr>
<th>My Hospital TAVR 30 Day Composite[^1][^2] (95% Interval)</th>
<th>Eligible Patients (Jan 1, 2017 – Dec 31, 2019)</th>
<th>Participant Rating</th>
<th>Distribution of Participant Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05 (-0.15 to 0.12)</td>
<td>160</td>
<td>★★</td>
<td>-0.2 -0.1 0 0.1 0.2</td>
</tr>
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[^1]: 30 Day Composite consists of six ordered categories based on the worst possible outcome (30-day death) to the best possible outcome (e.g. alive and free of major complications) during hospitalization and the 30-day follow-up period as defined below:

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6. None of the above

[^2]: The TAVR 30-day Mortality/morbidity composite is reported as a “win difference”

>0 implies “My Hospital” has better than expected performance

<0 implies “My Hospital” has worse than expected performance
A Composite Metric For Benchmarking Site Performance In Transcatheter Aortic Valve Replacement: Results From The STS/ACC TVT Registry

Nimesh D. Desai MD PhD
On behalf of the STS/ACC TVT Registry Risk Modeling Subcommittee
TAVR Outcomes in the United States

Wide variation in TAVR mortality is occurring at the SITE level

Murugiah et al JACC 2015

Vemulapalli et al NEJM 2019
Why Develop a Composite Morbidity and Mortality Measure for TAVR?

- Patients care about outcomes beyond peri-procedural mortality
  - Alive and Well with improved functional status and quality of life
- Composite measures can summarize all available information about the quality of care delivered using high quality, validated clinical data
- Move away from surrogate measures of quality such as volume towards real clinical outcomes
- Concept is well established in CABG, Valve Surgery
Study Purpose

• The purpose of this study was to determine if there is site-level variation in quality of care in TAVR in the United States using a novel patient-centric 30-day composite outcome measure.

Key Features:
• Fatal and Non-Fatal Outcomes
• Robust, non-parsimonious
• Incorporating novel data elements such as gait speed and KCCQ
  • functional status, patient reported health status
• Highly patient-centric, meaningful endpoints
• Responsive to changes in patient populations and technologies
Methods: Patient Cohort

- All patients undergoing TAVR in the United States for symptomatic aortic stenosis between Jan 1, 2015 – Dec 31, 2017 were included from the STS/ACC TVT Registry.

- Based on conventions established for the TVT 30-day mortality model, data from hospitals with >10% missing data for the outcome variable and other key study variables were excluded.

---

**Derivation cohort of Composite Mortality and Morbidity Risk Model**

<table>
<thead>
<tr>
<th>Inclusion-Exclusion</th>
<th>Sites</th>
<th>Records</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inclusion: Index TAVRs procedures in patients discharged from 01JAN2015-31DEC2017</td>
<td>556</td>
<td>114121</td>
</tr>
<tr>
<td>Inclusion: Sites with &gt;=90% completeness data for Ranked Endpoint, KCCQ-baseline and 5 m walk</td>
<td>301</td>
<td>54217</td>
</tr>
<tr>
<td>Inclusion: Ranked Endpoint status available</td>
<td>301</td>
<td>52561</td>
</tr>
</tbody>
</table>

---

[Logos: NCDR, STS National Database, STS/ACC TVT Registry]
Methods: Development of Ranked Composite Outcome

Understanding what Matters to Patients

- The selection and rank order of the periprocedural complications for the composite was determined by their adjusted association with 1-year mortality and patient quality of life (KCCQ)
  - Not Expert Opinion, Delphi Process
- Any outcome with significant HR was maintained
- (New Pacemaker and Major Vascular complications were not significant)

<table>
<thead>
<tr>
<th>30-day Non-fatal complications after TAVR</th>
<th>1-yr Mortality</th>
<th>1-yr KCCQ-OS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adjusted Hazard Ratio</td>
<td>P-value</td>
</tr>
<tr>
<td>Any stroke</td>
<td>2.2 (1.7, 2.9)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Major or Life-threatening/Disabling Bleed</td>
<td>1.9 (1.4, 2.6)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Acute kidney injury (Stage III)</td>
<td>1.8 (1.4, 2.4)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Paravalvular Leak (Moderate/Severe)</td>
<td>1.5 (1.2, 1.8)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>
TVT Risk Model Composite: Global Ranking of Endpoints

- **Death**
  - In-Hospital or 30-day mortality

- **Stroke**
  - In-Hospital or 30-day stroke

- **Bleed**
  - In-hospital or 30-day VARC major/life threatening/disabling bleed

- **AKI**
  - In-hospital of 30-day creatinine increase or 30 day new dialysis (AKI III)

- **PVL**
  - In-hospital or 30-day moderate/severe peri-valvular leak (PVL)

- **None**
  - None of the above

---

If a patient experienced multiple outcomes captured in the global rank composite measure, the outcome with the highest rank was assigned.
# Results:
Morbidity and Mortality Composite Components

## Frequency of Global Ranking Categories in Study Cohort

<table>
<thead>
<tr>
<th>Endpoint Category</th>
<th>Number (N = 52,561)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 = In-hospital/30-day death</td>
<td>1671</td>
<td>3.2%</td>
</tr>
<tr>
<td>2 = In-hospital/30-day stroke</td>
<td>1077</td>
<td>2.0%</td>
</tr>
<tr>
<td>3 = In-hospital/30-day VARC major/life threatening/disabling bleed</td>
<td>3024</td>
<td>5.8%</td>
</tr>
<tr>
<td>4 = AKI: In-hospital/30-day sig creatinine increase or new dialysis</td>
<td>336</td>
<td>0.6%</td>
</tr>
<tr>
<td>5 = In-hospital/30-day moderate/severe peri-valvular leak (PVL)</td>
<td>1304</td>
<td>2.5%</td>
</tr>
<tr>
<td>6 = None of the above</td>
<td>45149</td>
<td>85.9%</td>
</tr>
</tbody>
</table>
Primary End-point Assessment:

**Overall Model:**
Hierarchical multi-category logistic regression model which estimates a set of hospital-specific odds ratios

**Site Difference**
Novel metric incorporating elements similar to ‘Win Ratio’

Risk Adjusted with 46 Covariates incl. Baseline KCCQ and Gait Speed

Sites whose outcomes were outside 95% confidence intervals of the average sites were considered to be performing worse or better than expected. No prespecified outlier proportions.
Results: TVT Risk Model – Site Difference Morbidity and Mortality Composite (3 yr)

Number of Hospitals by Statistical Categorization Based on 95% Interval

<table>
<thead>
<tr>
<th>Worse Than Expected</th>
<th>As Expected</th>
<th>Better Than Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>34 / 301 (11%)</td>
<td>242 / 301 (80%)</td>
<td>25 / 301 (8%)</td>
</tr>
</tbody>
</table>
Validity: Risk Adjusted Outcomes by Site Status

Adjusted Observed/Expected Ratio

- **Death**: 1.25 (Worse than Expected), 1.01 (As Expected), 0.71 (Better than Expected)
- **Stroke**: 1.29 (Worse than Expected), 1.03 (As Expected), 0.73 (Better than Expected)
- **Major/LT/DA Bleed**: 2.13 (Worse than Expected), 1.02 (As Expected), 0.45 (Better than Expected)
- **AKI: Stage III**: 1.17 (Worse than Expected), 1.12 (As Expected), 0.67 (Better than Expected)
- **Mod/Sev PVL**: 2 (Worse than Expected), 1.19 (As Expected), 0.77 (Better than Expected)
Sensitivity Analyses: Remove KCCQ and Gait Speed

Eligible Centers in cohort: 301 to 447

8% Better than Expected
80% As Expected
12% Worse than Expected

1 of 301 Original Sites
Change Star Category

Correlation = 0.996
Sensitivity Analyses: 3 State instead of 6 State model

- **Death**
  - In-Hospital or 30-day mortality

- **Major Comp**
  - In-Hospital or 30-day major complication

- **None**
  - None of the above

2 of 301 Sites Change Star Category

Correlation = 0.998
Reliability Testing

• Reliability: A measure of how well one can confidently distinguish the performance of one site from another (Signal to Noise)

• There are three main drivers of reliability: sample size, differences between sites, and measurement error.

Potential Causes of Poor Reliability:
- Low Event Rates
- Short Periods of Observation (1-3 years of data)
- Programs with Small Sample Size
- Limited Variation in Outcomes b/w Programs

Value below 0.5 indicates poor reliability
Value above 0.5 indicates acceptable reliability
Values above 0.7-0.8 are desirable
Estimated reliability as a function of volume threshold for reporting

<table>
<thead>
<tr>
<th>Hospital TAVR Volume</th>
<th>Outcome Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30-Day Mortality</td>
</tr>
<tr>
<td>Hospitals with at least 10 cases</td>
<td>0.14</td>
</tr>
<tr>
<td>Hospitals with at least 25 cases</td>
<td>0.17</td>
</tr>
<tr>
<td>Hospitals with at least 50 cases</td>
<td>0.19</td>
</tr>
<tr>
<td>Hospitals with at least 75 cases</td>
<td>0.22</td>
</tr>
<tr>
<td>Hospitals with at least 100 cases</td>
<td>0.26</td>
</tr>
<tr>
<td>Hospitals with at least 200 cases</td>
<td>0.34</td>
</tr>
<tr>
<td>Hospitals with at least 500 cases</td>
<td>0.50</td>
</tr>
</tbody>
</table>

Derived from Monte Carlo Simulation
How does the model perform with contemporary data?

**Jan 1, 2015 to Dec 31, 2017**

<table>
<thead>
<tr>
<th>Endpoint Category</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death</td>
<td>1671</td>
<td>3.2%</td>
</tr>
<tr>
<td>Stroke</td>
<td>1077</td>
<td>2.0%</td>
</tr>
<tr>
<td>VARC Major or LT/Disabling Bleed</td>
<td>3024</td>
<td>5.8%</td>
</tr>
<tr>
<td>AKI (Stage III)</td>
<td>336</td>
<td>0.6%</td>
</tr>
<tr>
<td>Moderate/Severe peri-valvular leak</td>
<td>1304</td>
<td>2.5%</td>
</tr>
<tr>
<td>None of the above</td>
<td>45149</td>
<td>85.9%</td>
</tr>
</tbody>
</table>

**Jan 1, 2018 to Jun 30, 2019**

<table>
<thead>
<tr>
<th>Endpoint Category</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death</td>
<td>1307</td>
<td>2.6%</td>
</tr>
<tr>
<td>Stroke</td>
<td>1009</td>
<td>2.0%</td>
</tr>
<tr>
<td>VARC Major or LT/Disabling Bleed</td>
<td>2513</td>
<td>5.0%</td>
</tr>
<tr>
<td>AKI (Stage III)</td>
<td>250</td>
<td>0.5%</td>
</tr>
<tr>
<td>Moderate/Severe peri-valvular leak</td>
<td>625</td>
<td>1.2%</td>
</tr>
<tr>
<td>None of the above</td>
<td>45037</td>
<td>88.8%</td>
</tr>
</tbody>
</table>

**Worse Than Expected | As Expected | Better Than Expected**

<table>
<thead>
<tr>
<th></th>
<th>34 / 301 (11%)</th>
<th>242 / 301 (80%)</th>
<th>25 / 301 (8%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worse Than Expected</td>
<td>34/373 (9%)</td>
<td>328/373 (88%)</td>
<td>11/373 (3%)</td>
</tr>
</tbody>
</table>
Limitations

• Missing baseline KCCQ-12 and gait speed data limited the number of sites included in this analysis.
  • Sensitivity analyses showed that exclusion of these variables did not meaningfully change the categorization of sites
  • Significant educational efforts are being made to improve compliance and the inclusion of these variables within the TVT registry remains mandated by CMS.
  • 2019: 92% completeness for KCCQ
Conclusions

- We developed a novel patient-centric composite outcome for TAVR based on 30-day outcomes and their ranked association with both 1-year mortality and quality of life.

- We have identified significant site-level variation in mortality and major complications after TAVR procedures in the United States.

- The model demonstrated excellent performance including internal validity and moderate to high reliability even when including lower-volume programs.

- This 30-day composite metric is appropriate for high-stakes applications such as public reporting.
Methodology for Rating TAVR Centers

November 19, 2020

Presented by Tavia Binger, MSPH
Overall Goal of U.S. News TAVR Ratings:

Provide patients & families with patient decision support that is data-driven and easy to understand so that they can make the best decision for their health.
### Key Differences Between USN & TVT Ratings

<table>
<thead>
<tr>
<th></th>
<th>USNWR</th>
<th>STS/ACC TVT Registry</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Eligible Sites</strong></td>
<td>Any hospital that billed Medicare for TAVR</td>
<td>Must participate in TVT</td>
</tr>
<tr>
<td><strong>Primary Data Source</strong></td>
<td>CMS Medicare inpatient claims</td>
<td>Chart abstraction</td>
</tr>
<tr>
<td><strong>Patient Population</strong></td>
<td>Medicare fee-for-service, age 65+</td>
<td>All TAVR recipients</td>
</tr>
<tr>
<td><strong>Analytic Time Period</strong></td>
<td>2-year lag, 5-year window</td>
<td>Rolling 3-year window</td>
</tr>
<tr>
<td><strong>Outcomes/ Endpoints</strong></td>
<td>Death, stroke, discharge not home, readmission</td>
<td>Death, stroke, major/life threatening bleeding, acute kidney injury, paravalvular leak</td>
</tr>
<tr>
<td><strong>Structural Indicators</strong></td>
<td>Nurse staffing, Volume, etc.</td>
<td>Not included</td>
</tr>
<tr>
<td><strong>Statistical Testing for Outlier Determination</strong></td>
<td>p&lt;0.25</td>
<td>p&lt;0.05</td>
</tr>
<tr>
<td><strong>Public Reporting</strong></td>
<td>Involuntary, began July 2020</td>
<td>Voluntary, starts in 2021</td>
</tr>
</tbody>
</table>
Patient Outcomes
These measures are central to the ratings. To avoid penalizing hospitals that care for sicker or poorer patients, each is adjusted to account for clinical and socioeconomic differences.

- Readmission Prevention
- Prevention of Stroke
- Discharge to Home
- Survival

Processes of Care & Resources
To gauge how capable a hospital is at providing care, U.S. News combines key structural and process of care measures.

- Volume
- Nurse Staffing
- Patient Experience
- Cardiac ICU
- ICU Specialists

Overall Rating
Out of 621 hospitals that offered patients this procedure, 568 performed enough cases to be rated. The others had very limited experience in this procedure.

- High Performing
  Only 93 hospitals earned a High Performing rating in aortic valve surgery.

- Average
  367 Hospitals earned an Average rating.

- Below Average
  108 hospitals received a Below Average rating.

About U.S. News Best Hospitals Procedures & Conditions Methodology
- U.S. News reviewed over 50 million records of patient care provided at more than 4,500 hospitals. Aortic valve surgery was one of 10 procedures and conditions in which those hospitals were rated.
- More than 1,425 hospitals were rated High Performing in at least one procedure or condition. But only 37 got that top rating in all ten areas of care.
## Overall Transcatheter Aortic Valve Replacement (TAVR) Score

<table>
<thead>
<tr>
<th>Rating</th>
<th>High Performing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quality Indicators</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Survival</strong></td>
<td>Excellent</td>
</tr>
<tr>
<td>Relative survival 30 days after undergoing transcatheter aortic valve replacement, compared to other hospitals treating similar patients.</td>
<td></td>
</tr>
<tr>
<td><strong>Discharging patients to home</strong></td>
<td>Excellent</td>
</tr>
<tr>
<td>How often patients can go directly home from the hospital rather than being discharged to another facility. Recovery at home is preferred by most patients and families.</td>
<td></td>
</tr>
<tr>
<td><strong>Readmission prevention</strong></td>
<td>Average</td>
</tr>
<tr>
<td>How well the hospital keeps patients who had transcatheter aortic valve replacement from being readmitted in the first 30 days after discharge.</td>
<td></td>
</tr>
<tr>
<td><strong>Prevention of stroke</strong></td>
<td>Average</td>
</tr>
<tr>
<td>How well hospital prevents stroke from occurring in the first 30 days after the procedure. Stroke prevention is an important precaution for patients undergoing TAVR, because the procedure may put them at increased risk.</td>
<td></td>
</tr>
<tr>
<td><strong>Number of patients</strong></td>
<td>Very High</td>
</tr>
<tr>
<td>Relative volume of Medicare inpatients age 65 and over who had this procedure or condition in 2011-2018. Higher volume is associated with better outcomes.</td>
<td></td>
</tr>
<tr>
<td><strong>Patient experience</strong></td>
<td>Excellent</td>
</tr>
<tr>
<td>Reflects opinions of surveyed inpatients about the overall quality of their stay.</td>
<td></td>
</tr>
<tr>
<td><strong>Nurse staffing</strong></td>
<td>Very High</td>
</tr>
<tr>
<td>More nursing care per patient is associated with better outcomes and better patient experience.</td>
<td></td>
</tr>
<tr>
<td><strong>ICU Specialists</strong></td>
<td></td>
</tr>
<tr>
<td>Whether the hospital has at least one adult intensive-care unit staffed by a doctor specifically certified or trained to care for ICU patients.</td>
<td></td>
</tr>
<tr>
<td><strong>Cardiac ICU</strong></td>
<td></td>
</tr>
<tr>
<td>Whether the hospital has a specialized intensive-care unit for heart patients.</td>
<td></td>
</tr>
</tbody>
</table>
Website Display

<table>
<thead>
<tr>
<th>Rating</th>
<th>High Performing</th>
</tr>
</thead>
</table>

### Quality Indicators

#### Survival
Relative survival 30 days after undergoing transcatheter aortic valve replacement, compared to other hospitals treating similar patients.
- **5-tiered Outcomes**: Excellent

#### Discharging patients to home
How often patients can go directly home from the hospital rather than being discharged to another facility. Recovery at home is preferred by most patients and families.
- **5-tiered Outcomes**: Excellent

#### Readmission prevention
How well the hospital keeps patients who had transcatheter aortic valve replacement from being readmitted in the first 30 days after discharge.
- **5-tiered Outcomes**: Average

#### Prevention of stroke
How well the hospital prevents stroke from occurring in the first 30 days after the procedure. Stroke prevention is an important precaution for patients undergoing TAVR, because the procedure may put them at increased risk.
- **5-tiered Outcomes**: Average

#### Number of patients
Relative volume of Medicare inpatients age 65 and over who had this procedure or condition in 2014-2018. Higher volume is associated with better outcomes.
- **5-tiered Outcomes**: Very High

#### Patient experience
Reflects opinions of surveyed inpatients about the overall quality of their stay.
- **5-tiered Outcomes**: Excellent

#### Nurse staffing
More nursing care per patient is associated with better outcomes and better patient experience.
- **5-tiered Outcomes**: Very High

#### ICU Specialists
Whether the hospital has at least one adult intensive-care unit staffed by a doctor specifically certified or trained to care for ICU patients.

#### Cardiac ICU
Whether the hospital has a specialized intensive-care unit for heart patients.
Website Display

5-tiered Outcomes

Volume range
### Overall Transcatheter Aortic Valve Replacement (TAVR) Score

#### Rating
- High Performing

### Quality Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Survival</strong></td>
<td>Excellent</td>
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<td></td>
</tr>
</tbody>
</table>

| **Number of patients** | Very High |
| Relative volume of Medicare inpatients age 65 and over who had this procedure or condition in 2014-2016. Higher volume is associated with better outcomes. |

| **Patient experience** | Excellent |
| Reflects opinions of surveyed inpatients about the overall quality of their stay. |
| **Nurse staffing**     | Very High |
| More nursing care per patient is associated with better outcomes and better patient experience. |
| **ICU Specialists**    |            |
| Whether the hospital has at least one adult intensive-care unit staffed by a doctor specifically certified or trained to care for ICU patients. |
| **Cardiac ICU**        |            |
| Whether the hospital has a specialized intensive-care unit for heart patients. |

#### 5-tiered Outcomes

- Excellent
- Average
- Excellent
- Very High
- Excellent

#### Volume range

- Range: 422 to 9166
Eligibility & Inclusion Criteria

In addition to existing inclusion criteria for Procedures & Conditions Rating methodology.
## Definition of the TAVR cohort

<table>
<thead>
<tr>
<th>ICD-10-PCS Code</th>
<th>ICD-10 PCS Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>02R.F37Z</td>
<td>Replacement of Aortic Valve with Autologous Tissue Substitute, Percutaneous Approach</td>
</tr>
<tr>
<td>02R.F38Z</td>
<td>Replacement of Aortic Valve with Zooplastic Tissue, Percutaneous Approach</td>
</tr>
<tr>
<td>02R.F3JZ</td>
<td>Replacement of Aortic Valve with Synthetic Substitute, Percutaneous Approach</td>
</tr>
<tr>
<td>02R.F3KZ</td>
<td>Replacement of Aortic Valve with Nonautologous Tissue Substitute, Percutaneous Approach</td>
</tr>
<tr>
<td>02R.F37H</td>
<td>Replacement of Aortic Valve with Autologous Tissue Substitute, Transapical, Percutaneous Approach</td>
</tr>
<tr>
<td>02R.F38H</td>
<td>Replacement of Aortic Valve with Zooplastic Tissue, Transapical, Percutaneous Approach</td>
</tr>
<tr>
<td>02R.F3JH</td>
<td>Replacement of Aortic Valve with Synthetic Substitute, Transapical, Percutaneous Approach</td>
</tr>
<tr>
<td>02R.F3KH</td>
<td>Replacement of Aortic Valve with Nonautologous Tissue Substitute, Transapical, Percutaneous Approach</td>
</tr>
<tr>
<td>X2R.F332</td>
<td>Replacement of Aortic Valve using Zooplastic Tissue, Rapid Deployment Technique, Percutaneous Approach, New Technology Group 2</td>
</tr>
</tbody>
</table>
# Risk-adjusted Claims-based Outcome Measures

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Description</th>
<th>C-stat</th>
<th>Analogous TVT Endpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death</td>
<td>Mortality within 30 days of procedure date</td>
<td>.78</td>
<td>Yes</td>
</tr>
<tr>
<td>Stroke</td>
<td>Stroke within 30 days of procedure date</td>
<td>.77</td>
<td>Yes</td>
</tr>
<tr>
<td>Discharge Not Home</td>
<td>Measures discharges to a location other than the patient’s home, such as a SNF or LTAC</td>
<td>.80</td>
<td>No</td>
</tr>
<tr>
<td>Readmission</td>
<td>Unplanned readmissions within 30 days of discharge date</td>
<td>.65</td>
<td>No</td>
</tr>
</tbody>
</table>
Risk Adjustment Covariates

All covariates are derived from claims data and applied in multilevel logistic regression models.
A Closer Look: Readmission Outcome Measure

● Based on the CMS Hospital-Wide All-Cause Unplanned Readmission Measure
  ○ Endorsed by NQF in 2012 (NQF# 1789)

● All unplanned readmissions are counted, regardless of the cause

● Excludes types of care that are always considered planned
  ○ Examples: chemotherapy, transplant surgery

● Excludes readmissions for most scheduled procedures
  ○ Examples: hip replacement, spinal fusion
  ○ Unless principal diagnosis indicates an acute admission (Example: acute renal failure)
### Composite Model Comparison: TAVR, SAVR, CABG

<table>
<thead>
<tr>
<th>Measure</th>
<th>Data Source</th>
<th>TAVR</th>
<th>SAVR</th>
<th>CABG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death</td>
<td>Medicare claims</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Stroke</td>
<td>Medicare claims</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharge Not Home</td>
<td>Medicare claims</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Readmission</td>
<td>Medicare claims</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Prolonged Stay</td>
<td>Medicare claims</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Procedural Volume (2014-2018)</td>
<td>Medicare claims</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Voluntary Public Reporting Status</td>
<td>STS.org</td>
<td>n/a</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Publicly Reported Composite Score</td>
<td>STS.org</td>
<td>n/a</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Nurse-Patient Ratio, Intensivist, and Cardiac ICU</td>
<td>Amer. Hosp. Assoc.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Patient Experience</td>
<td>HCAHPS</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Measure</td>
<td>Data Source</td>
<td>TAVR</td>
<td>SAVR</td>
<td>CABG</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-----------------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Death</td>
<td>Medicare claims</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Stroke</td>
<td>Medicare claims</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharge Not Home</td>
<td>Medicare claims</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Readmission</td>
<td>Medicare claims</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Prolonged Stay</td>
<td>Medicare claims</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
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<td>Medicare claims</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Voluntary Public Reporting Status</td>
<td>STS.org</td>
<td>n/a</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Publicly Reported Composite Score</td>
<td>STS.org</td>
<td>n/a</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Nurse-Patient Ratio, Intensivist, and Cardiac ICU</td>
<td>Amer. Hosp. Assoc.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Patient Experience</td>
<td>HCAHPS</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Future of Public Reporting in TAVR Rating

- Two additional candidate measures:
  - Public Transparency (0/1 Indicator)
    - Opt in to public reporting with TVT Registry
    - Cut-off date to be announced in Q1 of 2021
  - Published STS/ACC Score (Continuous measure)
    - No display on our website
<table>
<thead>
<tr>
<th>Composite Rating</th>
<th>TAVR</th>
<th>SAVR</th>
<th>CABG</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Performing</td>
<td>91 (15%)</td>
<td>204 (18%)</td>
<td>258 (23%)</td>
</tr>
<tr>
<td>Average</td>
<td>369 (59%)</td>
<td>529 (47%)</td>
<td>573 (50%)</td>
</tr>
<tr>
<td>Low Performing</td>
<td>110 (18%)</td>
<td>209 (19%)</td>
<td>286 (25%)</td>
</tr>
<tr>
<td>Unrated</td>
<td>52 (8%)</td>
<td>186 (16%)</td>
<td>25 (2%)</td>
</tr>
<tr>
<td>Total No. of Centers</td>
<td>622 (100%)</td>
<td>1,128 (100%)</td>
<td>1,142 (100%)</td>
</tr>
</tbody>
</table>
## Concordance of U.S. News and STS for SAVR

Table includes only centers that publicly reported via STS and were rated in AVR by U.S. News in July 2020.

<table>
<thead>
<tr>
<th></th>
<th>STS 1-star AVR</th>
<th>STS 2-star AVR</th>
<th>STS 3-star AVR</th>
</tr>
</thead>
<tbody>
<tr>
<td>USN Low Performing</td>
<td>&lt;1%</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>USN Average</td>
<td>1%</td>
<td>55%</td>
<td>1%</td>
</tr>
<tr>
<td>USN High Performing</td>
<td>23%</td>
<td></td>
<td>7%</td>
</tr>
</tbody>
</table>
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<td>7%</td>
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</tbody>
</table>

Statistical testing at \( p<0.25 \) significance level

More hospitals in the High Performing and Low Performing categories
Race and Risk Post-Surgery: Uncovering Disparities in Aortic Valve Replacement

Do different subgroups experience differential treatment once they arrive at the hospital?

By Greta Martin, Tavia Binger, and Ronan Corgel   Aug. 18, 2020, at 9:00 a.m.

ACCORDING TO A STUDY BY The Commonwealth Fund, America ranks last among industrialized countries in measures of health equity and access to care, and has done so each year the study has been published, starting in 2004. Despite clear advancements in technology and delivery of care, accessing these health care innovations remains more of a privilege than a right in the United States.

In the first piece of this ongoing series, we revealed pronounced racial gaps in who has access to surgical care across several widely performed procedures. Another crucial component of assessing disparities in health care is understanding what happens after patients are able to access care. Do different subgroups experience differential treatment once they arrive at the hospital? In order to examine this question, we took a closer look at racial differences in health outcomes for the same eight procedures examined in the first article, focusing on death and...
Figure 4. Percent of Aortic Stenosis Patients Receiving Transcatheter Aortic Valve Replacement (TAVR)

White patients with aortic stenosis are more likely to receive a TAVR surgery than Black patients with the same diagnosis.

The TAVR surgical gap between white and Black aortic stenosis patients has been increasing over the past seven years. In 2018, 24.4% of white patients with aortic stenosis received a TAVR surgery, while only 14.4% of Black patients with aortic stenosis had a TAVR surgery performed on them.

Source: Centers for Medicare and Medicaid Services, 2012 - 2018 • Get the data • Created with Datawrapper
Figure 4. Percent of Aortic Stenosis Patients Receiving Transcatheter Aortic Valve Replacement (TAVR)

White patients with aortic stenosis are more likely to receive a TAVR surgery than Black patients with the same diagnosis.

The TAVR surgical gap between white and Black aortic stenosis patients has been increasing over the past seven years. In 2012, 14.4% of white patients with aortic stenosis received a TAVR surgery, while only 8.4% of Black patients with aortic stenosis had a TAVR surgery performed on them.

Source: Centers for Medicare and Medicaid Services, 2012 - 2018 - Get the data - Created with Datawrapper

Figure 3. Percent of Aortic Stenosis Patients Receiving Aortic Valve Surgery (AVR)

White patients with aortic stenosis are more likely to receive an AVR surgery than Black patients with the same diagnosis.

The AVR surgical gap between white and Black aortic stenosis patients has been fairly consistent over the years. In 2012, 10.2% of white patients with aortic stenosis received an AVR surgery, while only 4.5% of Black patients with aortic stenosis had an AVR surgery performed on them.

Source: Centers for Medicare and Medicaid Services, 2012 - 2018 - Get the data - Created with Datawrapper
Map 2. Procedural Volume of AVR and TAVR Hospitals with Counties Shaded by Percent of the Medicare-eligible Population that is Black

Hospitals that offer AVR alone are generally lower in volume than hospitals that offer both AVR and TAVR. Furthermore, high-volume TAVR hospitals are often not located in areas that are geographically accessible to Black patients.

Percent of the Medicare-eligible population that is Black

<table>
<thead>
<tr>
<th>Percent of the Medicare-eligible population that is Black</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0%</td>
</tr>
</tbody>
</table>

Combined AVR and TAVR Volume

- **≤ 50**
- **1,000**
- **2,000**
- **3,000**
- **4,000**
- **5,000**

Service Provided

- **AVR & TAVR**
- **AVR only**

Filter by Service

- Multiple values

Sources

Procedural volumes are derived using inpatient Medicare claims from the Centers for Medicare and Medicaid Services for 2014-2018. Demographic information is U.S. Census Bureau data from 2014 to 2018.
Health Equity Index

- Goal: Benchmark hospital or system performance on measures of equity
- Domains
  - Access
  - Outcomes
  - Mitigation of Social Determinants of Health
  - Others TBD
- Stay tuned for webinar in early 2021

Link to Register for Webinar:
Key Takeaways

- There are fundamental differences between USN and STS/ACC methodology
  - Different patient population
  - Different data source
  - Voluntary vs. involuntary public reporting
  - Statistical testing for outlier determination
  - USN includes structural indicators

- Ratings do not currently use TVT Registry data, but a strong possibility for this in the future

**Goal:** Provide patients & families with patient decision support that is data-driven and easy to understand so that they can make the best decision for their health.
Thank you
STS voluntary public reporting
2010-2020

David M. Shahian, MD
Massachusetts General Hospital, Harvard Medical School

November 19, 2020
Questions (and Answers)

David J. Cohen, MD MSc
University of Missouri-Kansas City
• Why is life-threatening and major bleeding being used as an endpoint?
TVT Registry Questions

- **What echo is used to measure PVL?**
  - post-implant, pre-discharge, 30-day?
USNWR Questions

• If a patient had TAVR in preparation for hip surgery, does the admission for hip surgery count as a readmission?
TVT Registry Questions

• Can we just post our hospital procedural volumes if we do not like our star rating?
TVT Registry Questions

• Why are you using rolling 3-years of data?
• Aren’t you concerned that sites will send patients home when they really need extended care in order to avoid getting “dinged”?
• Why do you require 90% complete baseline KCCQ and 5MWT data in order to report?
USNWR Questions

- Does my site get points for being in the TVT registry?
- Does my site get points for publicly reporting in TVT?
TVT Registry Questions

- **What timeframe will be included in the 2021 report?**
- **Do we need to have entered data prior to 2018 in order to be rated?**
Comprehensive stroke centers will have higher numbers of strokes than non-CSC sites. Is it fair to include this outcome in the quality measure?
USNWR Questions

• How is readmission scored? Does it matter if it is valve-related or non-valve related?