MCSQI Annual Report | 2021

The Maryland Cardiac Surgery Quality Initiative's (MCSQI) Annual Report is a confidential report detailing the activities and achievements of MCSQI. It is intended for use by physicians, administrators, data managers and the cardiac surgery community for development and evaluation of quality improvement plans.

The source of statewide outcome metrics and calculations are from the MCSQI data warehouse. MCSQI member hospitals submit Society of Thoracic Surgeons (STS) Adult Cardiac Surgery data on a quarterly basis. STS exclusion criteria and Observed-to-Expected recalibration coefficients are applied.

All data in this report is protected from disclosure pursuant to the provisions of Maryland statutes as may be applicable.

Unauthorized disclosure or duplication is absolutely prohibited.

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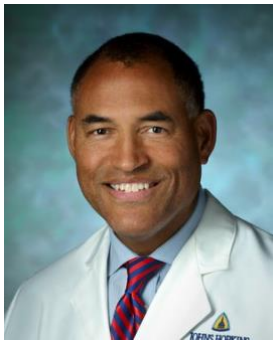
Letter from the Chairman



Thomas Matthew, MD
Director, Johns Hopkins Cardiothoracic Surgery at Suburban Hospital

Dear Colleagues,

Now in our eighth year, the MCSQI continues to advance the quality of cardiac surgery in the State of Maryland. Engagement among our members has improved as the impact from COVID-19 settled down and in-person semi-annual meetings resumed with a virtual option.

The organization remains steadfast to fulfill our mission to continuously improve the clinical quality of cardiac surgery in the state of Maryland through data analysis, research, and education and I want to personally thank those who have actively participated in our quality improvement initiatives.

A few highlights of 2021 that are further expanded upon in this report include:

- Educational webinars on perfusion services were held with guest speakers that provided valuable information on Goal Directed Perfusion and Measuring Perfusion Performance.
- MCSQI Data Management Tenets were developed through a collaborative effort of data managers and cardiac surgeons with the goal to create best practice guidelines to improve the quality and efficiency of STS data documentation, abstraction, and reporting process for cardiac surgery programs in Maryland.
- Semi-annual individual hospital STS Performance Review letters were prepared and distributed. The goal of the letters is to increase awareness and communication within each institution about how they compare to the state mean for key cardiac surgery quality indicators.
- The MCSQI continued its commitment to the advancement of 2021 Key Quality Initiatives:
    - Readmission Reduction
    - Understanding Postoperative Atrial Fibrillation Variability
    - Cost Analysis and Improving Value
    - Blood Management Improvement
    - Perfusion services

This report highlights progress made with these initiatives and others through collaboration among key stakeholders and a firm commitment to our mission.

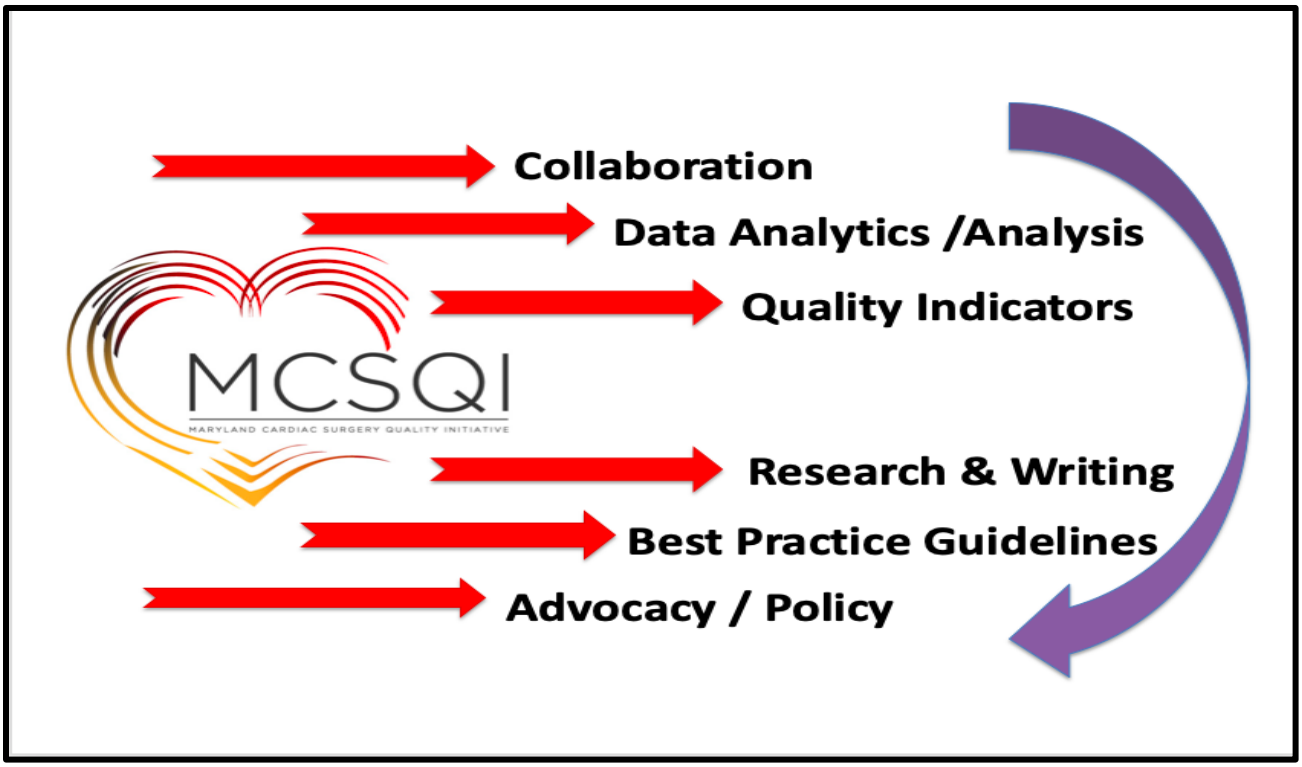
I encourage you to share this report with your team and hope you benefit from the information provided.

Sincerely,

Thomas Matthew, MD, MS, FACS, FACC
Chairman, MCSQI

MCSQI Overview

MCSQI's MISSION is to continuously improve the clinical quality of cardiac surgery provided in the state of Maryland through data analysis, research, and education.



Since 2013, MCSQI has brought surgeons, data managers and hospital administrators together to compare data, share best practices, perform outcome analyses, and implement process improvements. MCSQI has become a trusted, credible leader promoting a culture of continuous quality improvement in the cardiac surgery community. Benefits include reduced costs, enhanced clinical effectiveness, increased accountability, fewer regional variations, and stronger alliances between heart team members.

Our group endorses the spirit and intent of the Maryland Health Care Commission's (MHCC) legislative charge to improve oversight and maintain high performance standards in Maryland hospitals' cardiac programs.

MCSQI's Key Strategic Goals

***Improve Quality and Control Costs*:** MCSQI members collaborate to analyze hospital processes, work to identify opportunities for improvement and help implement relevant best practice protocols.

***Enhance Communications and Education*:** MCSQI serves as the interface to communicate process of care information between member sites, eliminating decision making in silos and connecting clinical teams.

***Inform MHCC Policy*:** MCSQI helps establish a voice within the state's healthcare legislation by providing MHCC committees and staff with ways to define and assess cardiac surgery performance.

MCSQI Overview

Organizational Focus

The organization provides value to its stakeholders by improving the quality of care through data analysis and implementing best practice protocols led by the Board of Directors, Quality Committee and Research and Writing Committee.

***Benchmarking and Reporting*:** MCSQI focuses on selecting quality indicators, establishing baseline data, designing scorecards, addressing privacy and confidentiality, and using providers' commentary as context to better understand trends and variations. Data managers convene regularly to standardize coding practices, allowing for timely, sound, and accurate interpretations of cardiac surgery performance reports.

***Quality and Cost Improvements*:** Identification of statistically significant performance variations based on quarterly analysis of key clinical indicators have resulted in the development of MCSQI best practice guidelines. Involvement in the analysis process and implementation of practice guidelines has improved individual hospital outcomes. As a group, members analyze and compare performance data, share clinical protocols, develop recommended guidelines, and provide quality assessment tools.

***Communication and Education for Members*:** MCSQI's network of surgeons, data managers, clinical teams and administrators fosters statewide collaboration through in-person meetings, conference calls and site visits. Through dynamic communication MCSQI informs, motivates, builds trust, and increases transparency, which consequently helps affect meaningful organizational change.

***Regulatory / MHCC Policy Engagement*:** Informative and timely updates to MCSQI members about proposed MHCC projects, regulatory changes and comment periods are provided. MCSQI works collaboratively with MHCC and submits consensus recommendation statements representing all 11 cardiac surgery programs to both MHCC and the Maryland Hospital Association.

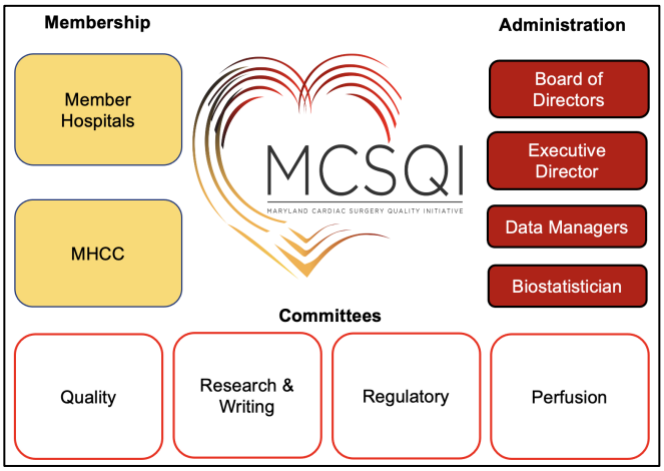
***Expansion to Multi-disciplinary Collaboration*:** MCSQI has expanded participation to include cardiac anesthesiologists, perfusionists, cardiac rehabilitation specialists, and interventional cardiologists. A multi-disciplinary approach expands opportunity for quality improvement through enhanced coordination and delivery of value-based care. This approach also provides opportunities to collaborate with payers.

***Research and Writing Publications*:** Over 38 research posters, manuscripts, and presentations have been presented at national surgical society meetings. In addition to MCSQI's Director of Analytics, a biostatistician is contracted to assist MCSQI with committee-approved quality research projects and publications.

***Regional and National Collaboration*:** MCSQI has entered into formal agreements and projects with other cardiac quality consortiums such as the Virginia Cardiac Services Quality Initiative and the National Cardiac Surgery Quality IMPROVE Network that represents six regional collaboratives comprised of over 90 programs.

Organizational Model

MCSQI is a non-profit consortium supported by all the hospitals that perform cardiac surgery in the state of Maryland. The organization is governed by cardiac surgeons and cardiovascular administrators from each of the member hospitals.



2021 Organizational Highlights

MCSQI's In-person Semi-annual networking and educational meetings resumed in November, 2021 with a full day Data Manager's Workshop followed by an evening event with the general membership. The featured speaker was Kevin W. Lobdell, MD, LTC, MC, USAR, Professor & System Director Cardiovascular Quality, Education, and Research Atrium Health, discussed Atrium Health's "Perfect Care" quality improvement initiative.

Educational webinars on perfusion services were held*:*

> ***Goal-Directed Perfusion webinar with guest speakers*** Eric Etchill, MD, Cardiac Surgery Research Fellow at Johns Hopkins School of Medicine "Exploring the Meaning, Relationships, and Use of Lactate in Cardiac Surgery", Charles Brown, MD, Johns Hopkins Cardiac Anesthesiologist, and moderator Glenn Whitman, MD, Chair, MCSQI Quality Committee. A group discussion ensued on the top elements for intraoperative success.
>
> ***Measuring Perfusion Performance webinar with guest speaker*** Al Stammers, MSA, PBMS, CCP Emeritus, Vice President, Clinical Quality and Outcomes Research, Specialty Care.

Semi-annual individual hospital STS Performance Review letters were prepared and distributed. The goal of the letters is to increase awareness and communication within each institution about their performance compared to the state mean for key cardiac surgery quality indicators.

MCSQI Data Management Tenets were developed through the leadership of Elizabeth Passano, MS, Chair, MCSQI Data Manager Committee and Thomas Matthew, MD, and participation of data managers. The goal of the Tenets is to create best practice guidelines to improve the quality and efficiency of STS data documentation, abstraction, and reporting for cardiac surgery programs in Maryland.

Successful linking of MCSQI's STS data with expanded administrative financial for inpatient and outpatient services performed in regulated space was completed and several cost/value projects were initiated.

COVID-19 Impact

STS Major Procedure Volumes and Outcomes: MCSQI vs. STS Total

	2019 to 2020 Change		2020 to 2021 Change	
Variable	**National**	**MCSQI**	**National**	**MCSQI**
Volume	-15%	-16%	+10%	+18%
Elective	-19%	-24%	+17%	+35%
Non-Elective	-12%	-9%	+4%	+8%
O/E Mortality (iCABG)	+11%	+3%	-4%	+12%
Readmission Rate	-5%	-21%	-4%	+26%

In 2021, procedure volumes bounced back from low levels in 2020 caused by the onset of the COVID-19 pandemic. Notably, however, Mortality and Readmission rates have risen in 2021.

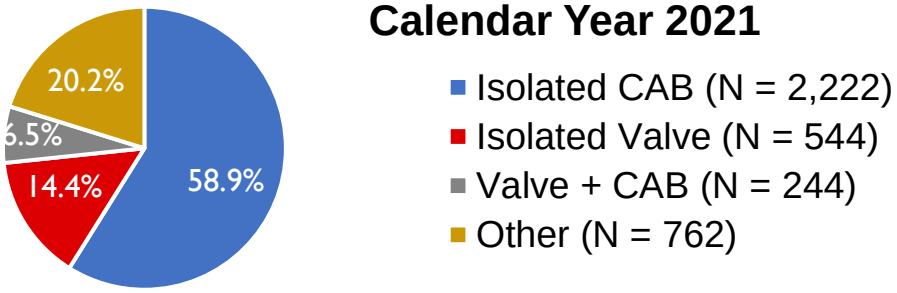
MCSQI members also analyzed STS metrics between patients with a prior COVID infection compared against patients with no known COVID diagnosis.

COVID-19 Patient Comparison: STS Major Procedures, Q1 2020 – Q4 2021

	COVID	Non-COVID	p-value
N	207	5,425	
Elective Procedure	46.4%	41.7%	0.18
Predicted Risk of Mortality	2.2%	1.9%	0.10
Operative Mortality (Observed)	4.8%	2.7%	0.06
Postop Pneumonia	3.4%	1.9%	0.14
Prolonged Ventilation	6.8%	7.1%	0.87
Renal Failure	4.3%	2.4%	0.08
Mean LOS-SD	8.19	7.31	0.11
30-Day Readmission	15.6%	9.0%	**0.002**

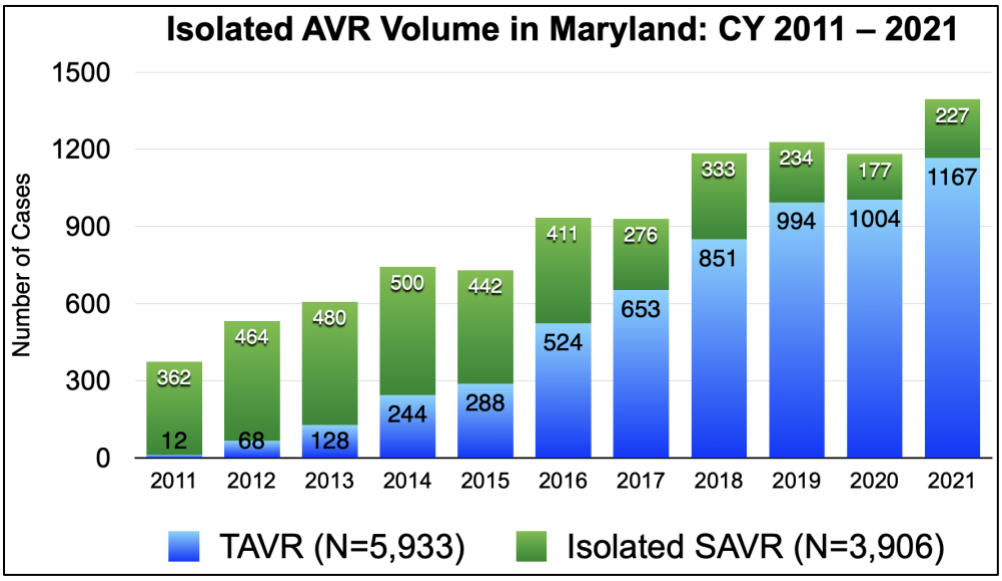
Volume Trends

Statewide Procedure Volume by STS Category: Calendar Year 2021



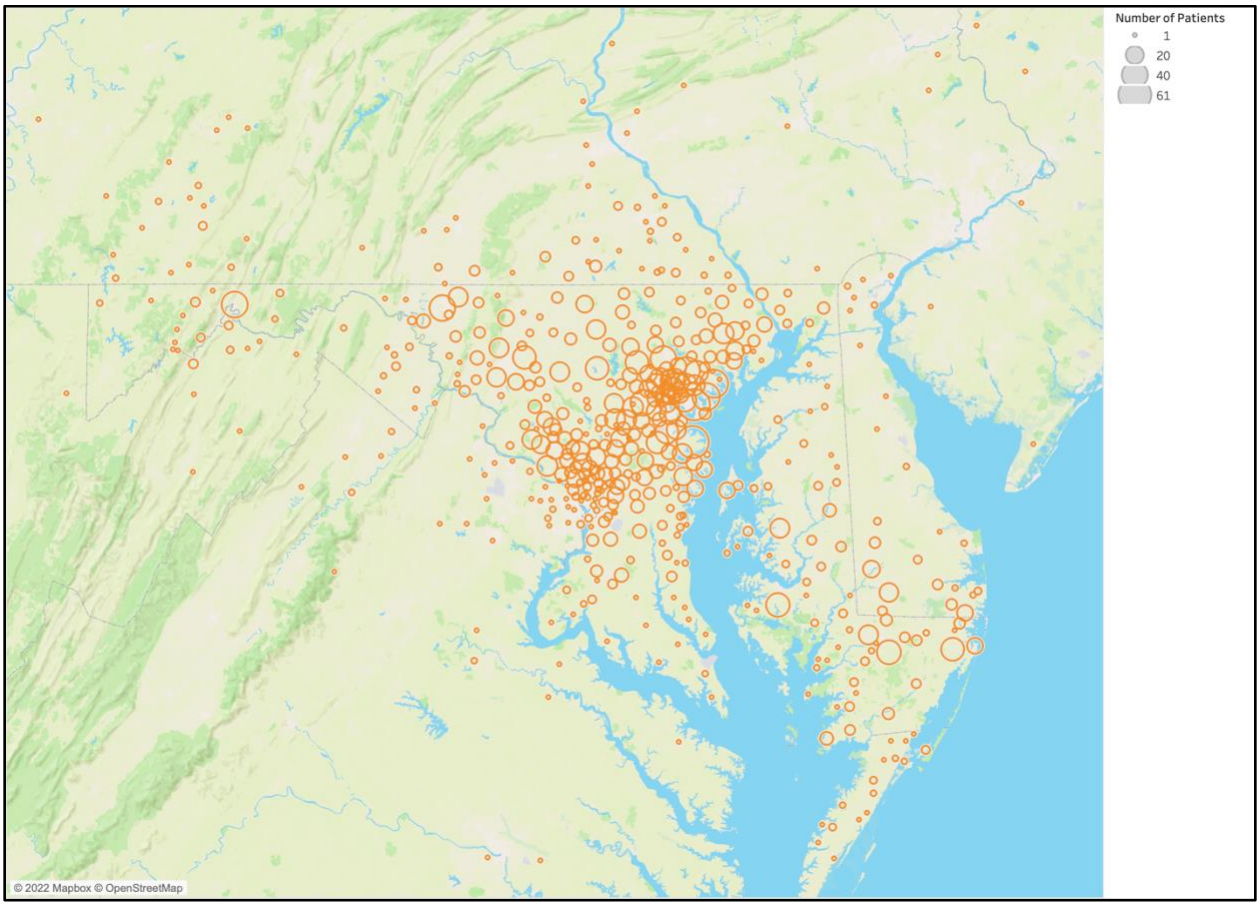
MCSQI Procedure Volume	2017	2018	2019	2020	2021
Isolated CABG	2,460 (58.5%)	2,300 (55.6%)	2,291 (58.4%)	1,872 (56.9%)	2,222 (58.9%)
Isolated AVR (SAVR)	276	333	235	177	227
AV Replacement + CABG	207	186	180	134	161
Isolated MVR	89	128	98	97	111
MV Replacement + CABG	29	29	29	29	27
Isolated MV Repair	221	253	222	250	206
MV Repair + CABG	53	50	46	44	56
Total: STS Major Procedures	**3,335 (79.4%)**	**3,279 (79.2%)**	**3,101 (79.1%)**	**2,603 (79.1%)**	**3,010 (79.8%)**
Other Procedures*	867 (20.6%)	860 (20.8%)	819 (20.9%)	688 (20.9%)	762 (20.2%)
Total: All Procedures	**4,202**	**4,139**	**3,920**	**3,291**	**3,772**

* Includes other cardiac surgery for ex: CABG or Valve + Other procedures, Transplants, VAD, Aortic Surgery. Excludes Transcatheter Procedures.



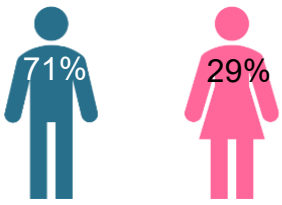
Patient Population

2021 Procedure Volume by Patient Home ZIP



Patient Demographics

Gender:



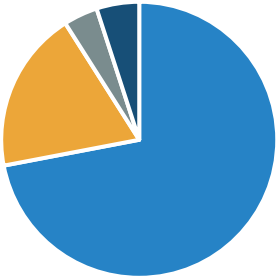
Hispanic or Latino:
3.1%

Primary Payor:

- Medicare: 47%
- Medicaid: 9%
- Commercial: 32%
- Other: 12%

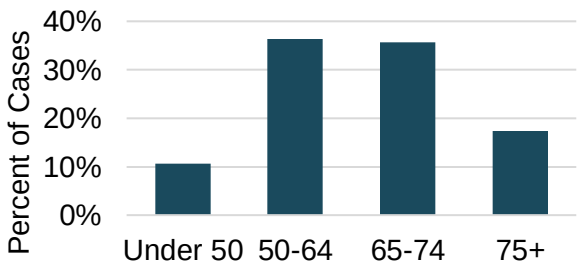
Race:

- White: 72%
- Black: 19%
- Asian: 4%
- Other: 5%



Age:

Mean: 63.9 Range: 18–93



Quality Committee

The Quality Committee is tasked with managing MCSQI's quality improvement agenda. The Chair is Glenn Whitman, MD and Co-chair is Thomas Matthew, MD. Membership is comprised of surgeons, data managers, intensivists, advanced practice providers, and administrators from the eleven MCSQI hospitals.

The Quality Committee examines hospitals' data from the statewide STS registry on a quarterly basis and correlates results with practice variation on key clinical indicators. Identification of statistically significant performance variances have resulted in the development of MCSQI best practice guidelines. Individual hospital outcomes have improved because of provider involvement in the analysis process and implementation of practice guidelines.

2021 Highlights:

	MCSQI Rates (Unadjusted)	2013 CAB Only	2021 CAB Only	Impact
Early Extubation / Prolonged Ventilation	Early Extubation	40%	71%	78% Improvement
	Prolonged Ventilation	9.5%	6.3%	34% Reduction
Blood Utilization	Intra-operative Blood Transfusion	39%	18%	54% Reduction
	Post-operative Blood Transfusion	34%	27%	21% Reduction
	Any Blood Transfusion	55%	33%	40% Reduction
MCSQI Blood Management	• Tenets, drafted under the leadership of Rawn Salenger, MD, representing the most critical components of blood management and conservation were approved by the board. • Communication and adoption of a blood conservation culture among the mutlidisciplinary cardiac surgery team was determined to be critical, in addition to key clinical elements.			
Readmission Reduction Initiative	• Readmission rates increased 26% in 2021 after a 21% decrease in 2020 that was potentially attributed to COVID-19 concerns among patients to return the hospital, access limitations, and limited bed availability, as well as virtual medical evaluation opportunities.			
Atrial Fibrillation Initiative	• New Onset of A-Fib variability rates continue to be monitored. State rates remained relatively constant in 2021 at 25.4% and consistant with the STS national rate. However, significant variances among programs continue.			

Quality Committee

2021 Highlights (continued)

Cost / Value Initiative	• A formal agreement between MCSQI, MHCC and HSCRC was finalized for MCSQI to obtain an expanded financial/administrative data set for inpatient and outpatient charges for services performed in HSCRC regulated space. • The HSCRC inpatient data set was successfully linked to MCSQI's STS data and research projects were initiated on the cost variability among programs.
Perfusion	• The committee continued efforts to establish a Perfusion Performance Dashboard and began to evaluate the cost of electronic data capture and EMR integration. • Two educational webinars were held and the group collaborated with the Virginia Cardiac Services Quality Improvement (VCSQI) to evaluate retrograde autologous priming (RAP) practices. • Collaborated with VCSQI to assess Acute Kidney Injury and Renal Failure performance and best practices.
Data Management	• A data manager work group, co-chaired by Thomas Matthew, MD and Elizabeth Passano, MS, collaborated with cardiac surgeons to create best practice guidelines to improve the quality and efficiency of STS data documentation, abstraction, and the reporting process for cardiac surgery programs in Maryland. The MCSQI Data Management Tenets were approved by the board.

Quality Committee

MCSQI DATA MANAGEMENT TENETS

Goal: Create best practice guidelines to improve the quality and efficiency of STS data documentation, abstraction, and reporting processes for Maryland Cardiac Surgery Programs.

STS Surgeon Champion

- Identify a Surgeon Champion who is either the MCSQI surgeon board member or a delegated surgeon from each cardiac surgery program.
- Support the STS data manager and the STS data collection and reporting process.
    - Review STS Outcome Metrics –National, Regional & Local Benchmarking
    - Meet with data managers at least monthly and serve as an educational resource for abstraction and clarification
    - Support the development of enhanced data collection tools
    - Act as a liaison to surgeons, clinical providers, informatics team, and leadership
    - Support professional development for data managers, including their attendance at STS AQO annual meetings, MCSQI data manager meetings and educational workshops.
- Endorse and communicate the MCSQI value to hospital administration and surgical colleagues. Disseminate MCSQI Annual Reports, quality improvement and research initiatives, publications, and practice protocols through the quality leadership chain.
- Be a change agent by reviewing and sharing data across multi-disciplinary teams (Perfusion, OR, Anesthesia, APP, CVSICU and CV Nursing teams, etc.) to identify opportunities for quality and process improvements.

Informatics Support: EMR Documentation & Data Extracts

- Incorporate STS fields in EMR documentation (Cardiac Surgery H&P, Brief OpNote, Operative Note, Anesthesia and Perfusion documentation, CVICU Intensivist Admission Note, Discharge Summary) to support STS data abstraction and STS audits performed by the STS and the Maryland Healthcare Commission.
- Periodically review and update Cardiac Surgery Documentation: H&P, OpNote, and Discharge Summary templates and Surgeon worksheets to ensure STS data elements are included and current with corresponding STS versions.
- Effectively use available technology and reporting tools to abstract, track, share, and audit STS data.

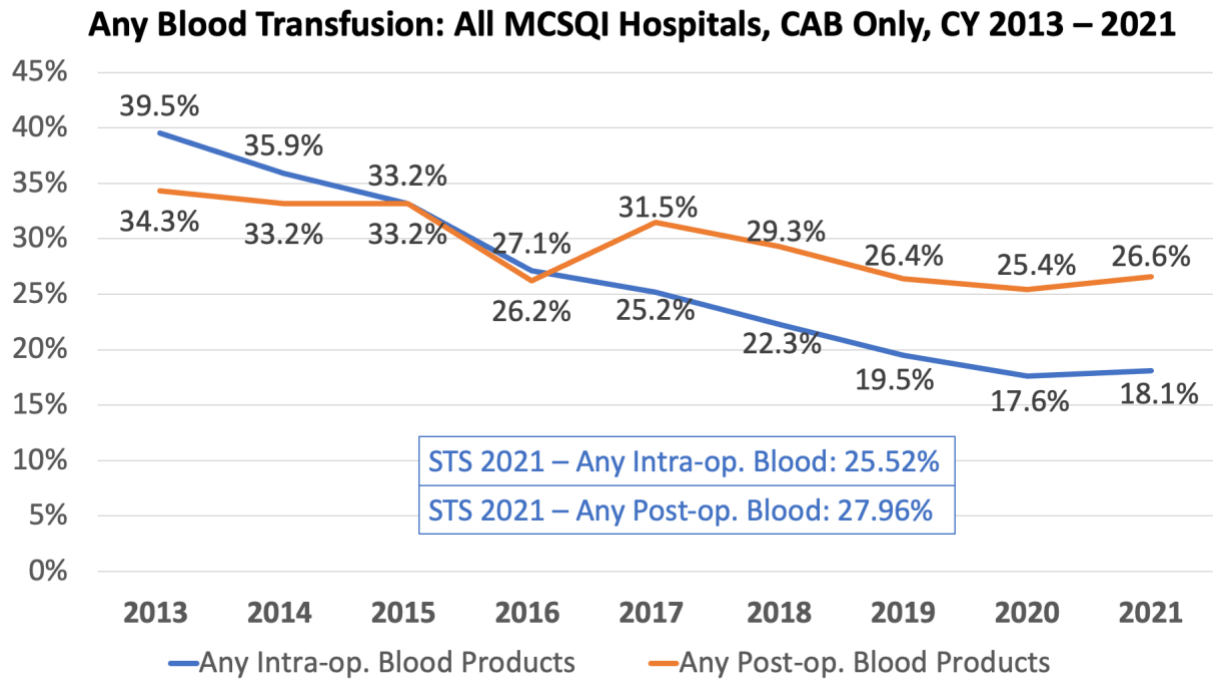
Data Management Quality Practices and Goals

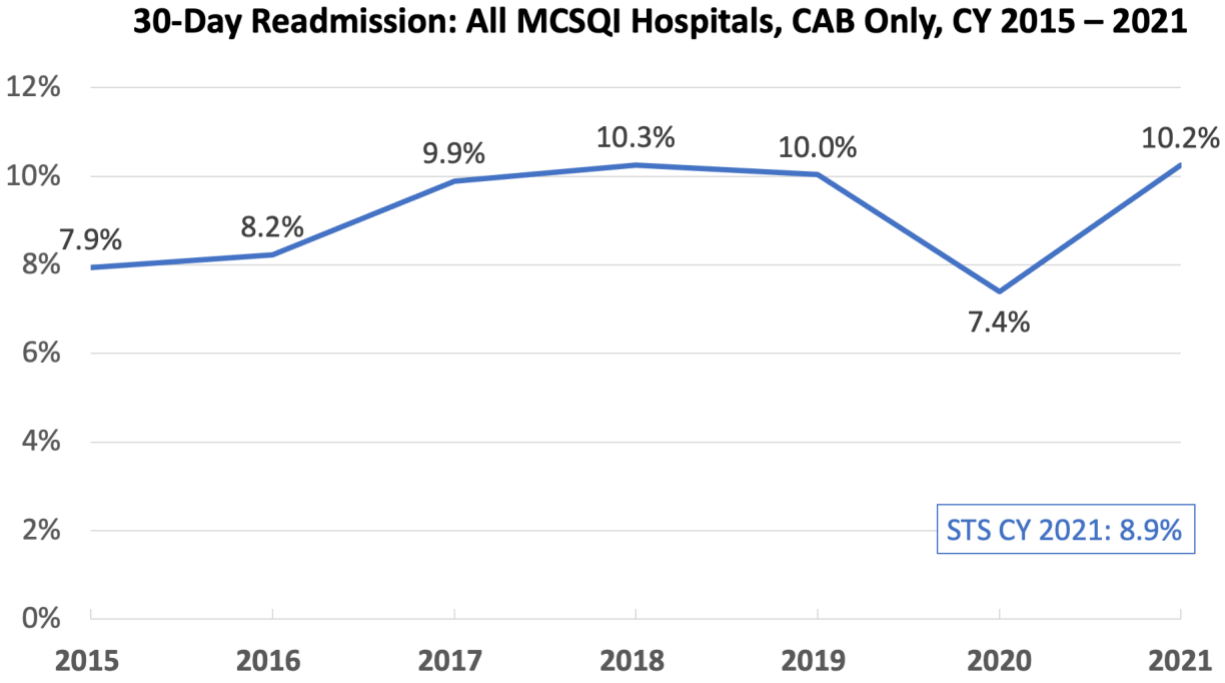
- Develop an educational slide deck or reference guide of key STS data and definitions to share with the Cardiac Surgery Team.
- Create and maintain a Source of Truth document to identify primary and secondary sources for data abstraction, per hospital.

MCSQI DATA MANAGEMENT TENETS (Continued)

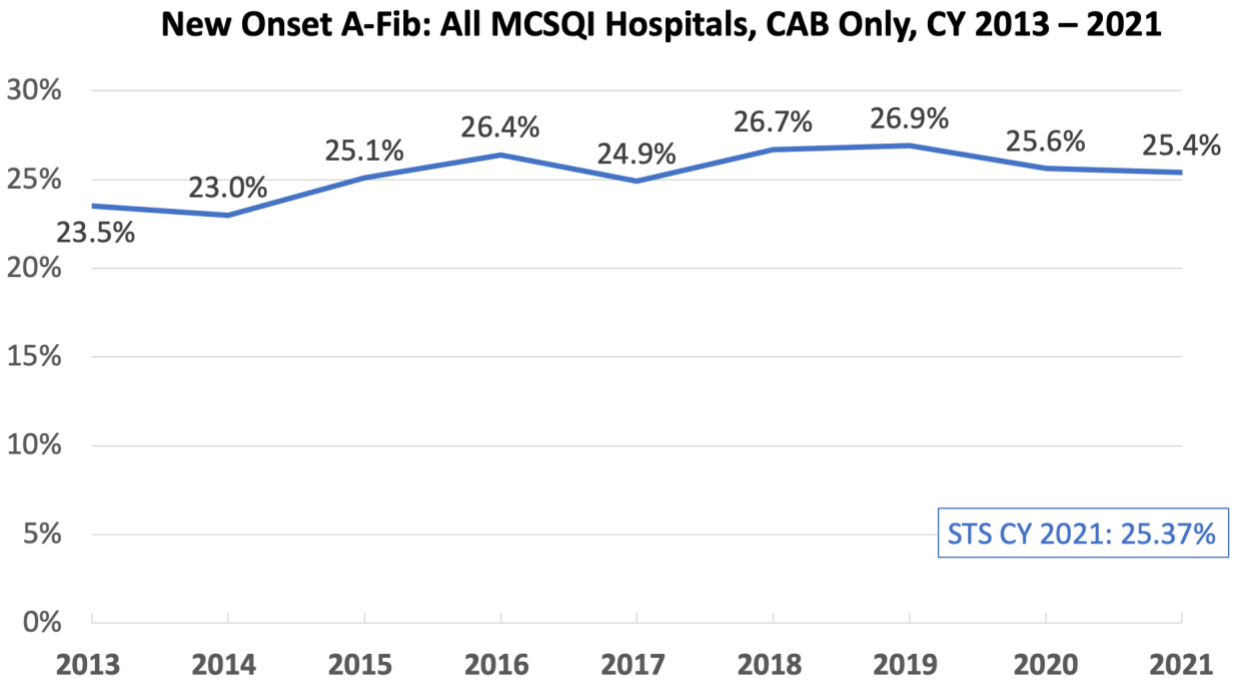
- Review monthly STS ACS FAQ updates with Surgeons and Clinicians to discuss changes and improve documentation to reflect these updates.
- Attend and participate in quarterly meetings with key stakeholders (Surgeons, Residents, APPs, Data Managers, Anesthesia, Perfusion, CV OR & ICU Teams, etc.) to review data metrics, documentation issues, and quality improvement initiatives.
- Develop Standard Operating Procedures and Optimization Strategies for STS data abstraction, cleaning, data management and reporting.
    - Develop Data Management, Quality / Harvest Checklist for STS data utilizing:
        - IQVIA Quality Reports
        - IQVIA Operational Reports
        - IQVIA Library – Other Resources Sections
        - STS Vendor Reporting Tools
        - CRISP (HIE) Access
        - Michigan Data Checker
        - EMR Reports
    - Validate IQVIA Report Metrics with vendor reporting tools when possible.
    - Validate STS Public Reporting.
    - Review materials to maintain STS content education.
        - STS IQVIA updates
        - STS Training Manual
        - STS FAQ Summary Document
        - STS Registry Website: Additional Resources
    - Develop collaborative relationship with Care Team impacting STS data collection to provide education of STS definitions, documentation compliance and establish a “go to clinical colleague” when questions arise.
    - Develop collaborative relationship with peer Data Managers within your program, within MCSQI and Data Managers within the STS community.
    - Perform Data Manager internal audits for inter-rater reliability assessment when applicable.
- Explore STS Data Manager educational opportunities and training.
    - STS Monthly Educational Webinars
    - STS Data Manager Mentorship Program
    - STS AQO National Meetings
    - STS Data Manager Task Forces
    - MCSQI Data Manager Meetings and Workshops
    - MCSQI Bi-annual Meetings, QI, and R&W Committee Meetings
    - MCSQI Quality and Research Projects
- Meet annually with program leadership to evaluate Data Manager workload and review data management responsibilities to ensure adequate FTE resources are available for data abstraction, entry, cleaning, and reporting requests.

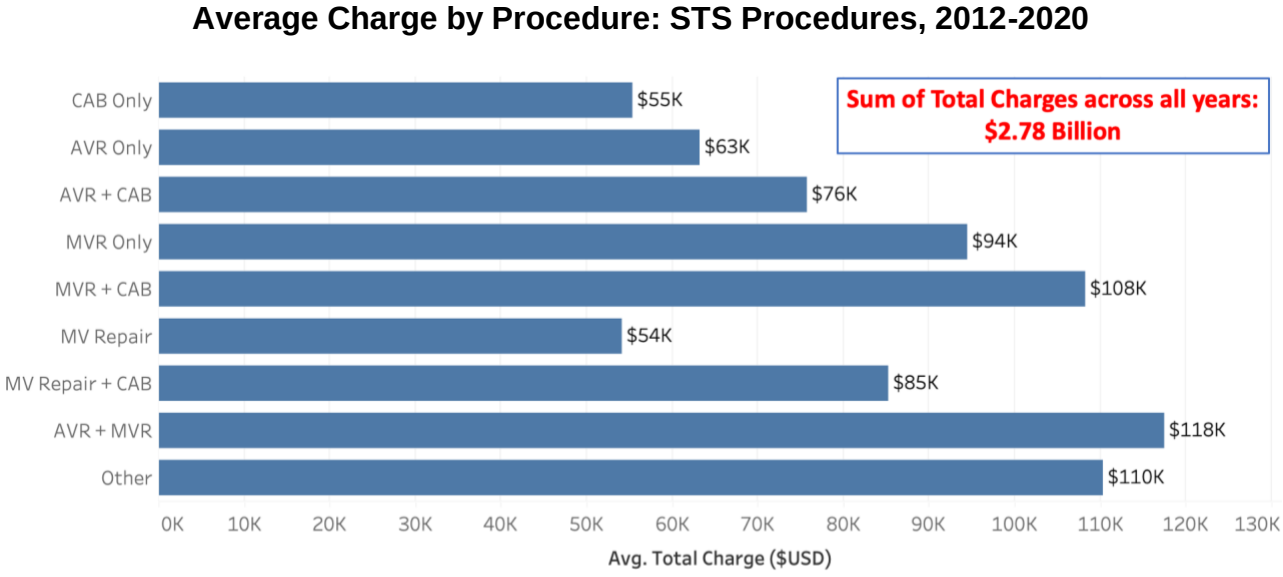
Quality Committee





Quality Committee





Source: HSCRC-STS Linked Data Set provided by MHCC and Advanta Government Services

Research and Writing Committee

The Research and Writing Committee, chaired by Niv Ad, MD of Adventist HealthCare White Oak Medical Center, and co-chair Diane Alejo of Johns Hopkins, continues to have excellent engagement and collaboration from MCSQI membership. The committee reviews and approves proposals for research and oversees the research process. Statistical analysis is performed by MCSQI's Biostatistician, Sari Holmes, PhD, an expert in analyzing STS data and conducting cardiovascular research. Eddie Fonner, MCSQI's Director of Analytics, manages the MCSQI data warehouse and provides analytics to support the work of the Research and Writing Committee's efforts to impact quality improvement and research at state, regional and national levels.

2021 Highlights

In 2021 MCSQI published three manuscripts and presented a poster as well an oral presentation at the national level.

Poster:

Strategies for Optimizing STS Data Quality and Efficiency – A Statewide Assessment
Society of Thoracic Surgeons Advances in Quality and Outcomes Meeting, October 2021.

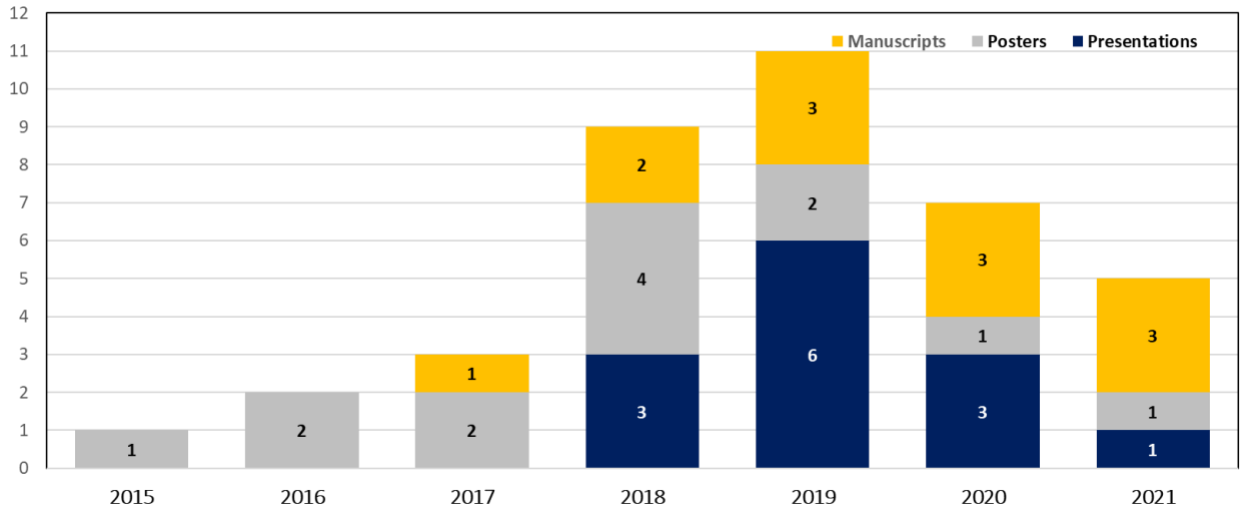
Presentation:

Association between Cerebral Oximetry Use and Perioperative Stroke in Patients Having Cardiac Surgery with CPB
American Society of Anesthesiologists Annual Meeting, October 2021.

Manuscripts

- Hospital Variability in Modifiable Factors Driving Coronary Artery Bypass Charges *(Journal of Thoracic and Cardiovascular Surgery).*
- Interhospital Failure to Rescue after Coronary Artery Bypass Grafting *(Journal of Thoracic and Cardiovascular Surgery).*
- A Comparison of Statistical Methods for Hospital Performance Assessment *(Journal of Hospital Administration).*

Research and Writing Committee



TOTAL	
Presentations	13
Posters	13
Manuscripts	12

Ongoing Projects:

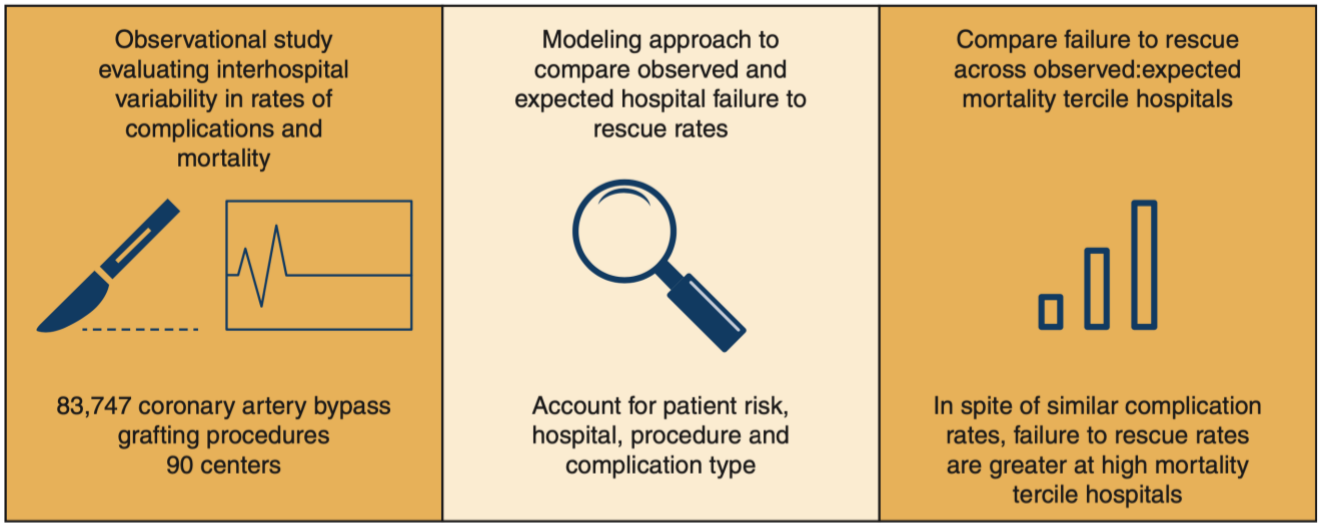
- **Analytical Innovation – Machine Learning and Artificial Intelligence**
  - MCSQI embarked on its first project using artificial intelligence and the MCSQI statewide dataset to develop a new prediction model of outcomes in cardiac surgery.
- **Four-State 90th Percentile Comparisons:** Virginia, Michigan, Washington, Maryland (66 Hospitals).
  - Utilizing a "high hurdle" 90th percentile benchmark, MCSQI hospitals continue to perform well compared to other regional consortia.
  - 80% of MCSQI programs had better outcomes than expected, compared to only 52% of the other collaboratives.

Research and Writing Committee

MCSQI Collaboration with The National Cardiac Surgery Quality IMPROVE Network:

Interhospital Failure to Rescue after Coronary Artery Bypass Grafting
(The *Journal of Thoracic and Cardiovascular Surgery).*

In this multi-collaborative cohort of 83,747 isolated CABG procedures, significant interhospital variation in mortality rates was driven principally by Failure to Rescue rates rather than complication rates. Efforts to reduce mortality should focus on identifying and implementing optimal rescue strategies.



Interhospital variability in successful rescue following coronary artery bypass grafting supports the importance of identifying best practices at high-performing hospitals, including early recognition and management of complications.

The National Cardiac Surgery Quality IMPROVE Network includes the following: The Clinical Outcomes Assessment Program, Maryland Cardiac Surgery Quality Initiative, The Michigan Society of Thoracic and Cardiovascular Surgeons Quality Collaborative, The Northern New England Cardiovascular Disease Study Group, The PH&S-Swedish Cardiovascular Clinical Performance Group, and The Texas Quality Initiative.

Data Manager Committee

MCSQI's STS Data Manager Committee, co-chaired by Elizabeth Passano, MS of Luminis Health Anne Arundel Medical Center, and Dawn Roach of University of Maryland St. Joseph Medical Center, serves as the backbone of the organization. The data managers share vital details related to data abstraction with their internal teams, which allows for more accurate and consistent data collection. Collaboration amongst the group is instrumental in ensuring that data is collected with the same understanding of STS definitions. MCSQI Data Managers also interface with counterparts nationally serve alongside surgeons on various committees within MCSQI.

2021 Highlights

Two "hybrid" data manager workshops were conducted to review challenging cases and confirm all members are up to date with the latest STS definition clarifications. STS surgeons have also participated in these workshops.

MCSQI Data Management Tenets were established and approved by the MCSQI board. Through a collaborative effort of data managers and cardiac surgeons, best practices were identified from formal surveys and discussion meetings. The goal of the Tenets is *to improve the quality and efficiency of STS data documentation, abstraction, and reporting processes for Maryland Cardiac Surgery Programs*.

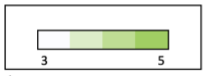
National collaboration and information sharing with the Society of Thoracic Surgeons and data managers from across the country occurred quarterly. The MCSQI Data Manager committee co-chairs participated in video calls to share ideas to enhance education and resolve concerns.

Poster presented at the 2021 Society of Thoracic Surgeons Advances in Quality and Outcomes conference:

Strategies for optimizing STS Data Quality and Efficiency – A Statewide Assessment.

The goal of this study was to identify limitations and challenges of current practices, as well as identify useful processes to enhance data quality. As a result of this study, discussions regarding best practices were enhanced. It was determined that standardization of data management practices will enhance the accuracy of data that is submitted to the STS Adult Cardiac Surgery Database.

Site (High to Low Volume)	Missing or Unknown 30-Day Status (Iso CAB)	Any Missing Risk Score Variable (Iso CAB)	Clinician Collaboration Score[1]	Surgeon Support		CRISP (HIE) Access[2]	EMR Integration	Non-IQVIA Reporting Tools[3]	Data Source Protocol for Abstraction	Internal Audits
				Worksheets	Champion					
A	0.47%	1.05%	3.4	✓	✓	✓	✓	✓	✓	✓
B	0.84%	0.32%	3.1		✓	✓		✓		
C	0%	0%	4.1	✓	✓	✓	✓	✓	✓	
D	0%	0.27%	5.0		✓	✓	✓			
E	0%	0%	3.8		✓	✓		✓		
F	0%	0.64%	3.6					✓		
G	1.38%	6.90%	5.0	✓	✓	✓		✓		
H	0%	0%	3.8	✓	✓	✓		✓		
I	0%	0%	4.8		✓		✓	✓		
J	0%	0%	4.6		✓	✓				

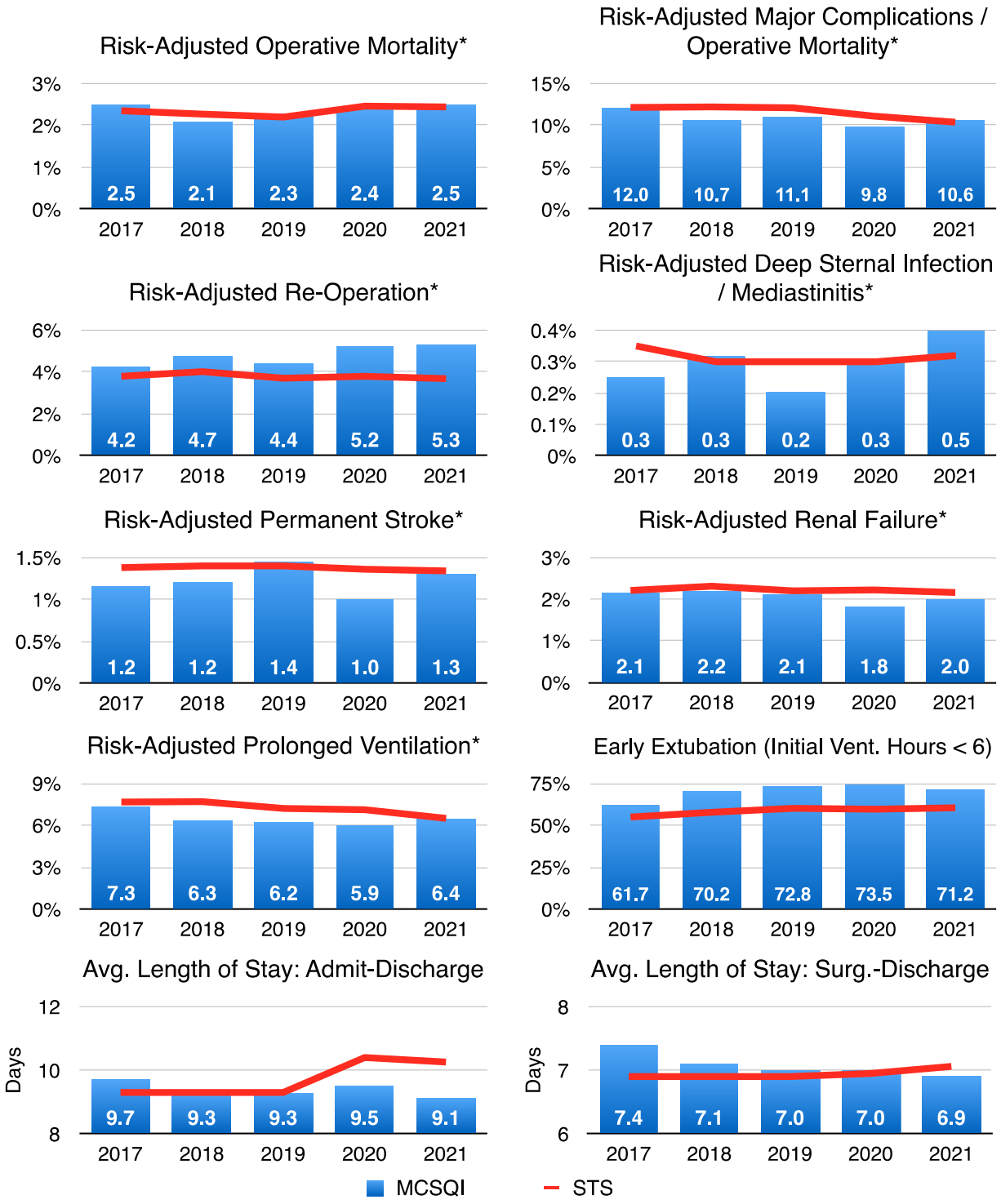


[1] Clinician Collaboration Score is the average rating on a scale of 1 to 5 of a data manager's confidence in their clinical team's support of abstraction, coding and harvest of ACSD data

[2] CRISP – Chesapeake Regional Information System for Our Patients (CRISP), HIE – Health Information Exchange

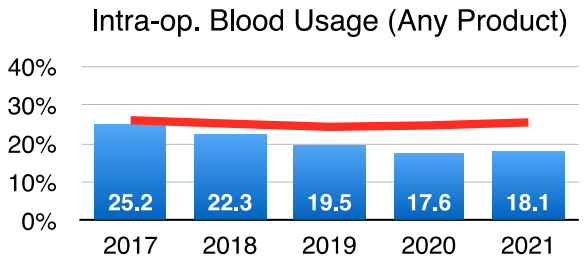
[3] Includes vendor reports, MSTCVS data quality checker, and other custom reporting

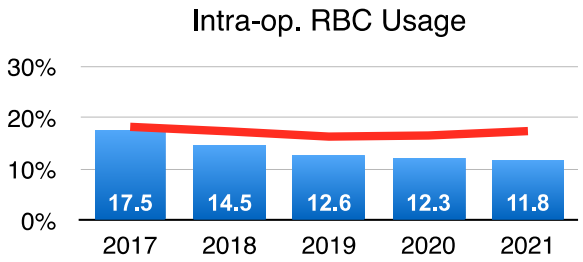
Clinical Quality Indicators – Isolated CABG

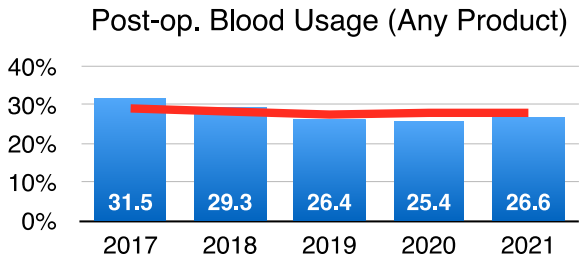


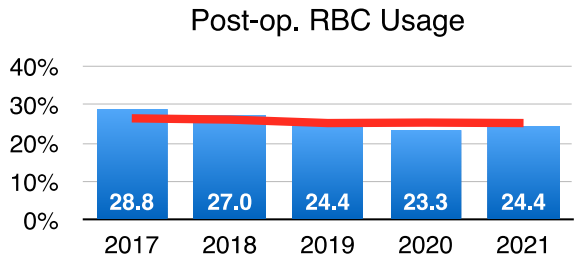
*__STS Risk-adjusted Rates.__ These calculations involve two steps: 1) Calculation of the O/E ratio, which divides the percentage of an observed morbidity by the rate predicted by the STS risk calculator, and 2) Multiplication of the O/E ratio by the STS national rate of the observed morbidity. All O/E ratios apply STS Recalibration coefficients, which normalize the national benchmark value to exactly 1.0. All Risk-adjusted Rates apply Recalibration coefficients from the CY 2018 STS report.

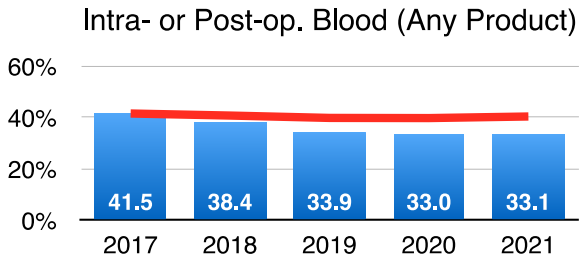
Clinical Quality Indicators – Isolated CABG

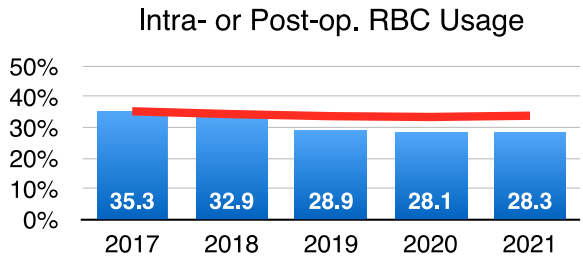


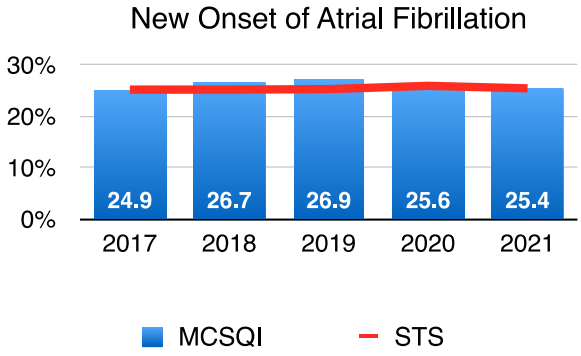












National Quality Forum Measures

Calendar Year 2021 Isolated CABG Procedures (unless otherwise indicated)		MCSQI	STS
Procedure Volume	Isolated CABG	2,222 (58.9%)	153,844 (54.9%)
	Isolated Valve	544 (14.4%)	39,055 (13.9%)
	CABG + Valve	244 (6.5%)	19,485 (6.9%)
	Other	762 (20.2%)	68,082 (24.3%)
Pre-Operative	Timing of Antibiotic Administration	99.3%	97.6%
	Selection of Antibiotic Administration	99.7%	98.3%
	Duration of Prophylaxis	99.5%	97.6%
	Pre-operative Beta Blockers	99.1%	90.5%
Operative	Use of Internal Mammary Artery	99.5%	99.5%
Complications**	Risk-Adjusted Prolonged Ventilation	6.4%	6.5%
	Risk-Adjusted Deep Sternal Infection	0.5%	0.3%
	Risk-Adjusted Permanent Stroke	1.3%	1.3%
	Risk-Adjusted Renal Failure	2.0%	2.2%
	Risk-Adjusted Cardiac-Related Re-Operation	3.0%	2.5%
Discharge	Anti-Platelets	99.8%	96.6%
	Beta Blockers	99.9%	94.5%
	Anti-Lipids	99.6%	98.7%
Mortality**	Risk-Adjusted Inpatient Mortality: Isolated CABG	2.0%	1.8%
	Risk-Adjusted Operative Mortality: Isolated CABG	2.5%	2.4%
	Risk-Adjusted Operative Mortality: AV Replacement, 2021	4.3%	2.3%
	Risk-Adjusted Operative Mortality: AV Replacement + CABG, 2021	5.9%	4.4%
	Risk-Adjusted Operative Mortality: MV Replacement, 2021	8.3%	5.3%
	Risk-Adjusted Operative Mortality: MV Replacement + CABG, 2021	19.9%	11.1%
	Risk-Adjusted Operative Mortality: MV Repair, 2021	0.5%	1.1%
	Risk-Adjusted Operative Mortality: MV Repair + CABG, 2021	0.0%	4.7%
Readmissions	30-Day Readmission Rate: Isolated CABG	10.2%	8.9%

** MCSQI Risk-Adjusted Rates are not statistically significantly different from STS National Rates.

STS Metric Specifications

Operative Mortality O/E*: Any death during patient hospitalization or within 30 days of surgery	**Inpatient Mortality O/E***: Any death during patient hospitalization
Prolonged Ventilation O/E*: Post-operative pulmonary ventilation greater than 24 hours	**Permanent Stroke O/E***: Post-operative stroke that did not resolve within 24 hours
Renal Failure O/E*: Increase in post-operative serum creatinine greater than 3 times baseline, serum creatinine greater or equal to 4 mg/dL, or new requirement for dialysis post-operatively	**Mediastinitis O/E***: Any post-operative deep sternal wound infection or mediastinitis during patient hospitalization or within 30 days of surgery
Re-Operation O/E*: Return to the operating room for bleeding, valve dysfunction, graft occlusion, aortic intervention, or other cardiac reasons (the NQF definition does not include 'other non-cardiac reasons')	**Morbidity/Mortality O/E***: Any patient incurring operative mortality or any of the five major STS morbidities
Readmissions within 30 Days: Any patient who was readmitted for inpatient stay at an acute care facility within 30 days of discharge	**Re-Operation for Bleeding**: Re-exploration for mediastinal bleeding either in the ICU or return to operating room
Length of Stay (LOS) Admit-Discharge: Total number of days from patient admission to discharge	**Length of Stay (LOS) Surgery-Discharge**: Total number of days from surgery to discharge
Post-Operative Ventilation Time: Total amount of time from operating room exit to initial extubation, plus any additional time spent on pulmonary ventilation	**Early Extubation**: Initial Ventilation Hours less than 6, including patients who were extubated in the operating room
Intra-Operative Blood Products: Any patient who was transfused any time intra-operatively during the initial surgery.	**Post-Operative Blood Products**: Any patient who was transfused any time post-operatively
New Onset of Atrial Fibrillation: Any patient with post-operative Atrial Fibrillation; excludes patients with pre-operative history of atrial fibrillation or arrhythmia.	***The Observed-to-Expected Ratio (O/E)**: These calculations divide the percentage of an observed morbidity by the rate predicted by the STS risk calculator. All O/E ratios apply STS Recalibration coefficients, which normalize the national benchmark value to exactly 1.0.

Posters, Manuscripts and Presentations

Posters

Strategies for optimizing STS Data Quality and Efficiency – A Statewide Assessment.
Society of Thoracic Surgeons Advances in Quality and Outcomes, 2021.

Multiple Arterial Grafts in Coronary Artery Bypass Surgery: Variation in Practice & Outcomes. *Society of Thoracic Surgeons Advances in Quality and Outcomes, 2020.*

The Value and Impact of A Statewide Quality Collaborative.
Society of Thoracic Surgeons Advances in Quality and Outcomes, 2019.

Complementing Society of Thoracic Surgeons (STS) Adult Registry Data with Financial Data – A First Pass. *Society of Thoracic Surgeons Advances in Quality and Outcomes, 2019.*

Predictors of Operative Mortality in Cardiac Surgery Patients with Prolonged Ventilation.
American College of Surgeons Clinical Congress, 2018.

Government Based Insurance is Associated with Fewer Arterial Conduits in CABG.
American College of Surgeons Clinical Congress, 2018.

Contemporary Outcomes Comparing Mitral Valve Repair and Replacement in the Elderly in a Statewide Registry. *Heart Valve Society Scientific Meeting, 2018.*

Off-pump Coronary Artery Bypass in Octogenarians: Results of a Statewide, Matched Comparison. *Society of Thoracic Surgeons Annual Meeting, 2018.*

Variations in Perfusion Practice during Adult Cardiac Surgery: A Statewide Survey.
Eastern Cardiothoracic Surgical Society (ECTSS) Annual Meeting, 2017.

Sternal Wound Care Practices in Maryland Cardiac Surgery Programs.
Society of Thoracic Surgeons Advances in Quality and Outcomes Meeting, 2017.

STS Data Managers & Surgeons Enhancing Quality Measurement – Statewide Review of Reasons for Prolonged Ventilation.
Society of Thoracic Surgeons Advances in Quality and Outcomes Meeting, 2016.

Are Surgeons Discussing STS Predicted Risk Scores? A Look across Maryland Hospitals.
Society of Thoracic Surgeons Advances in Quality and Outcomes Meeting, 2016.

The Maryland Cardiac Surgery Quality Initiative: Collaborating to Improve Outcomes Statewide.
Society of Thoracic Surgeons Advances in Quality and Outcomes Meeting, 2015.

Manuscripts

A Comparison of Statistical Methods for Hospital Performance Assessment.
Wu X., Zhang M, Jin R, Grunkemeier GL, Maynard C, Hira RS, MacKenzie T, Herbert M, He C, Holmes SD, Thompson MP, Likosky DS.
Journal of Hospital Administration. 2021 Jun. 10(3), 32-40.

Posters, Manuscripts and Presentations

Hospital Variability in Modifiable Factors Driving Coronary Artery Bypass Charges.
Salenger R, Etchill EW, Fonner CE, Alejo D, Matthew TL. Whitman GJR, Schena S, Gammie JS, Taylor B, Metkus TS, Holmes SD, Ad N, and the Maryland Cardiac Surgery Quality Initiative. *Journal of Thoracic and Cardiovascular Surgery. 2021 Mar 9;S0022-5223(21)00420-7. doi: 10.1016/j.jtcvs.2021.02.094.*

Interhospital Failure to Rescue after Coronary Artery Bypass Grafting
Likosky DS, Strobel RJ, Wu X, Kramer RS, Hamman BL, Brevig JK, Thompson MP, Ghaferi AA, Zhang M, Lehr EJ, National Cardiac Surgery Quality IMPROVE Network. *Journal of Thoracic and Cardiovascular Surgery. 2021 Jan 29;S0022-5223(21)00163-X. doi: 10.1016/j.jtcvs.2021.01.064. PMID: 33712236 DOI: 10.1016/j.jtcvs.2021.01.064. Online ahead of print.*

Clinical Practice Variation and Outcomes for Stanford Type A Aortic Dissection Repair Surgery in Maryland: Report from a Statewide Quality Initiative.
Mazzeffi M, Ghoreishi M, Alejo D, Fonner CE, Tanaka K, Abernathy JH 3rd, Whitman G, Salenger R, Lawton J, Ad N, Brown J, Gammie J, Taylor B; Investigators for the Maryland Cardiac Surgery Quality Initiative. *Aorta (Stamford). 2020 Jun;8(3):66-73. doi: 10.1055/s-0040-1714121. Epub 2020 Nov 5. PMID: 33152787.*

Racial Disparity in Cardiac Surgery Risk and Outcome: Report From a Statewide Quality Initiative.
Mazzeffi M, Holmes SD, Alejo D, Fonner CE, Ghoreishi M, Pasrija C, Schena S, Metkus T, Salenger R, Whitman G, Ad N, Higgins RSD, Taylor B, MCSQI.
Annals of Thoracic Surgery 2020 Jan 18. DOI: 10.1016/j.athoracsur.2019.11.043 PMID: 31962111.

Mitigating the Risk: Transfusion or Reoperation for Bleeding After Cardiac Surgery.
Pasrija C, Ghoreishi M, Whitman G, Ad N, Alejo DE, Holmes SD, Schena S, Salenger R, Mazzeffi MA, Fonner CE, Taylor B; Investigators for the Maryland Cardiac Surgery Quality Initiative.
Annals of Thoracic Surgery. 2019 Dec 19.
doi: *10.1016/j.athoracsur.2019.10.076. [Epub ahead of print] PMID: 31866482.*

Predictors of Operative Mortality Among Cardiac Surgery Patients with Prolonged Ventilation.
Suarez-Pierre A, Fraser CD, Zhou X, Crawford TC, Lui C, Metkus TS, Whitman GJ, Higgins RS, Lawton JS.
Journal of Cardiac Surgery. 2019 Jul 3. doi: 10.1111/jocs.14118. [Epub ahead of print] PMID: 31269299.

Variation in Platelet Transfusion Practices in Cardiac Surgery.
Zhou X, Fraser CD 3rd, Suarez-Pierre A, Crawford TC, Alejo D, Conte JV Jr, Lawton JS, Fonner CE, Taylor BS, Whitman GJR, Salenger R.
Innovations (Phila). 2019 Apr;14(2):134-143. doi: 10.1177/1556984519836839. Epub 2019 Mar 18.

Posters, Manuscripts and Presentations

Bilateral Internal Mammary Artery Use in Diabetic Patients: Friend or Foe?
Crawford TC, Zhou X, Fraser III CD, Magruder JT, Suarez-Pierre A, Alejo D, Bobbitt J, Fonner CE, Wehberg K, Taylor B, Kwon C, Fiocco M, Conte JV, Salenger R, Whitman GJ; Investigators for the Maryland Cardiac Surgery Quality Initiative.
Annals of Thoracic Surgery. 2018 Oct; 106(4):1088-1094. doi:10.1016/j.athoracsur.2018.04.030. Epub 2018 Jun 20.

Off-Pump Coronary Artery Bypass in Octogenarians: Results of a Statewide, Matched Comparison.
Suarez-Pierre A, Crawford TC, Fraser III CD, Zhou X, Lui C, Taylor B, Wehberg K, Conte JV, Whitman GJ, Salenger R; MCSQI Collaborative.
General Thoracic and Cardiovascular Surgery. 2018 Oct 19. doi:10.1007/s11748-018-1025-8.

Less is More: Results of a Statewide Analysis of the Impact of Blood Transfusion on CABG Outcomes.
Crawford TC, Magruder JT, Fraser III CD, Suarez-Pierre A, Alejo D, Fonner CE, Canner J, Horvath K, Wehberg K, Taylor B, Kwon C, Whitman GJ, Conte JV, Salenger R. Investigators for the Maryland Cardiac Surgery Quality Initiative.
Annals of Thoracic Surgery. 2018 Jan;105(1):129-136. doi: 10.1016/j.athoracsur.2017.06.062. Epub 2017 Nov 1. PMID: 29074154.

Variation in Red Blood Cell Transfusion Practices During Cardiac Surgery Among Centers in Maryland: Results from A State Quality Improvement Collaborative.
Magruder JT, Blasco-Colmenares E, Crawford TC, Alejo D, Conte JV, Salenger R, Fonner CE, Kwon CC, Bobbitt J, Brown JM, Nelson MG, Horvath KA, Whitman GR.
Annals of Thoracic Surgery. 2017 Jan; 103(1):152-160. Epub 2016 Aug 20.

Podium Presentations:

Association between Cerebral Oximetry Use and Perioperative Stroke in Patients Having Cardiac Surgery with CPB.
American Society of Anesthesiologists Annual Meeting, 2021.

Dual Antiplatelet Therapy at Discharge is Safe after Acute Myocardial Infarction Treated with Coronary Artery Bypass Grafting yet Practice Variation Exists Within a Statewide Quality Collaborative.
Society of Thoracic Surgeons (STS) 55th Annual Meeting, 2020.

Evaluating the Role of Failure to Rescue on Mortality after Cardiac Surgery - A National Experience (Maxwell Chamberlain Memorial Paper Award: IMPROVE Network).
Society of Thoracic Surgeons (STS) 55th Annual Meeting, 2020.

A Maryland Cardiac Surgery Statewide Analysis of the Impact of Extubation in the Operating Room Following Routine Cardiac Surgery.
Society of Thoracic Surgeons (STS) 55th Annual Meeting, 2020.

Posters, Manuscripts and Presentations

Modifiable Inter-Hospital Cost Variability in Coronary Artery Bypass Surgery.
Eastern Cardiothoracic Surgical Society (ECTSS) 57th Annual Meeting. 2019.

Does the Number and Type of Blood Products Transfused Negatively Impact Patient Outcomes Following Open Heart Surgery?
American Association of Thoracic Surgery (AATS) Annual Meeting, 2019.

Racial Disparity in Cardiac Surgery Risk and Outcome: Report From a Statewide Quality Initiative.
American Association of Thoracic Surgery (AATS) Annual Meeting, 2019.

Center-specific Variation in Use of Dual Antiplatelet Therapy Prior to Coronary Surgery: An Outcome Analysis from the Maryland Cardiac Surgery Quality Initiative.
American Heart Association (AHA) Quality of Care and Outcomes Research Scientific Sessions, 2019.

Mitigating the Risk: Transfusion or Reoperation for Bleeding After Cardiac Surgery.
Society of Thoracic Surgeons (STS) 55th Annual Meeting, 2019.

Blood Utilization: Tale of Two Metrics – Improvement and Variability.
Society of Thoracic Surgeons (STS) 55th Annual Meeting, 2019.

Recent Antiplatelet Therapy Does Not Affect Short Term Outcomes Following Non-CABG Cardiac Surgery.
Southern Thoracic Surgical Association (STSA) 65th Annual Meeting, 2018.

Bilateral Internal Mammary Artery Utilization in Diabetics: Friend or Foe?
Society of Thoracic Surgeon (STS) 54th Annual Meeting, 2018.

Variation in Platelet Transfusion Practices During Cardiac Operations Among Centers in Maryland: Results from a State Quality-Improvement Collaborative.
Society of Thoracic Surgeon (STS) 54th Annual Meeting, 2018.

MCSQI Committee Leadership

Hospitals

Adventist HealthCare White Oak Medical Center
Johns Hopkins Hospital
Luminis Health Anne Arundel Medical Center
MedStar Union Memorial Hospital
Sinai Hospital
Suburban Hospital
TidalHealth Peninsula Regional
University of Maryland Capital Region Health
University of Maryland St. Joseph Medical Center
University of Maryland Medical Center
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Clifford E. Fonner, BA
John V. Conte, MD
Diane Alejo, BA

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Dawn Roach, RN, Co-chair	UM St. Joseph Medical Center
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Diane Alejo, BA	MCSQI / Johns Hopkins Hospital
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Holly Tannehill, CCP	Adventist HealthCare White Oak Medical Center
Christa Kampert	UM St. Joseph Medical Center
Terri Haber, MPH	MCSQI

Resources and Affiliates

RESOURCES:	
MCSQI Website	https://mcsqi.org
Maryland Health Care Commission (MHCC)	https://mhcc.maryland.gov
MHCC Quality Reports	https://healthcarequality.mhcc.maryland.gov
Maryland Health Services Cost Review Commission (HSCRC)	http://www.hscrc.state.md.us
Society of Thoracic Surgeons (STS)	https://www.sts.org
STS Public Reporting	https://publicreporting.sts.org/acsd
National Quality Forum (NQF)	http://www.qualityforum.org

AFFILIATES:	
ARMUS Corporation	https://www.armus.com
IMPROVE Network	http://www.improvenetwork.org
VCSQI Virginal Cardiac Services Quality Initiative	http://vcsqi.org

MCSQI Member Hospitals

Adventist HealthCare White Oak Medical Center

SINAI HOSPITAL A LifeBridge Health Center

JOHNS HOPKINS MEDICINE THE JOHNS HOPKINS HOSPITAL

UPMC | WESTERN MARYLAND

TidalHealth

Luminis Health

MedStar Union Memorial Hospital

SUBURBAN HOSPITAL JOHNS HOPKINS MEDICINE

UNIVERSITY of MARYLAND MEDICAL CENTER

UNIVERSITY of MARYLAND CAPITAL REGION HEALTH

UNIVERSITY of MARYLAND ST. JOSEPH MEDICAL CENTER

Testimonials

"The MCSQI has demonstrated that by working together on important clinical questions we can improve important quality metrics in the care of Maryland Cardiac Surgery patients and by rotating the leadership positions we can make sure that all of our state cardiac surgery programs are well represented and empowered to participate."

~John V. Conte, MD, Co-founder MCSQI

"The MCSQI state collaborative has been a successful collaboration of all the cardiac surgery centers in Maryland and is taking quality of care for cardiac surgery patients to an even higher level. The multidisciplinary interaction provides resources, networking, and sharing of best practices and ideas that has already demonstrated positive outcomes and has set the basis for future quality initiatives in cardiac surgery."

~ Chrissy Ruhl, UPMC Western Maryland

"It is gratifying to see Maryland's cardiac surgery programs working together to improve services for cardiac surgery patients. MCSQI's collaborative efforts bode well for future patients."

~ Eileen Fleck, Maryland Health Care Commission

"In this day and age with so much confrontation and dissension, it is comforting to note that the Maryland Cardiac Surgery Quality Initiative stands for just the opposite. Through the sharing of experience and data, collegiality and cooperation, MCSQI has a vision to improve the care that this state gives its cardiac patients. There are not many collaboratives throughout the country like this, and Maryland can count itself among those few that recognize the importance of this kind of united effort, where the only thing that matters is one common goal, better treatment for our patients."

~ Dr. Glenn Whitman, Johns Hopkins Hospital

Testimonials

"Following the pioneering efforts of Dr. Alfred Blalock at Johns Hopkins Hospital in the 1940's and Dr. Joseph McLaughlin at University of Maryland in the 1970's, the development of the Maryland Cardiac Surgery Quality Initiative (MCSQI) is probably the single most important advancement in the history of organization of cardiovascular medicine in the state of Maryland. The future of cardiac surgery in Maryland is dependent on statewide hospital and physician collaboration and sharing of "best practices."

~Dr. Kurt Wehberg, Peninsula Medical Regional Center

"MCSQI provides the framework for an ongoing unprecedented level of collaboration between cardiac surgery programs in Maryland. By learning from experiences at other high-quality programs, UM Saint Joseph Medical Center has been able to augment our own quality initiatives, and ultimately improve care for our patients."

~ Dr. Rawn Salenger, University of Maryland St. Joseph Medical Center

"In 2013 Maryland created a statewide cardiovascular quality initiative providing a platform for in depth review of the care our patients receive who undergo heart surgery. Success of a program is measured by its outcomes. The Society of Thoracic Surgery (STS) sets the 'National' benchmarks to measure this success. The data managers in MCSQI are committed to ensuring Maryland programs succeed in data integrity, as this is the core of meaningful data. Data Managers at all ten sites in Maryland work collaboratively, review patient scenarios/data definitions, etc. to ensure STS registry data is accurate, complete, reproducible, and reflect the quality of care for patients in Maryland. The data managers play a vital role in supporting the quality improvement goals of MCSQI at a regional level and align themselves with other regional STS collaboratives at a national level! This collaborative and supportive approach is the key to MCSQI's success in reporting surgical outcomes among all programs in our State."

~ Jennifer Cook, Adventist HealthCare White Oak Medical Center

Data Managers, Surgeons, APPs, Perfusionists, and CV Service Line Administrators Convene at the MCSQI Fall 2021 Meeting