

# The Society of Thoracic Surgeons National Database 2018 Annual Report



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The Society of Thoracic Surgeons (STS) National Database was established in 1989 as an initiative for quality improvement and patient safety among cardiothoracic surgeons. As of January 1, 2018, the STS National Database has four components, each focusing on a different area of cardiothoracic surgery—adult cardiac surgery, general thoracic surgery, and congenital heart surgery, as well as mechanical circulatory support through the STS Intermacs Database. In December 2015, *The Annals of Thoracic Surgery* began publishing a monthly series of scholarly

articles on outcomes analysis, quality improvement, and patient safety. As part of that series, this article provides an annual summary of the status of the STS National Database as of October 2018 and provides a synopsis of related articles that appeared in *The Annals of Thoracic Surgery* 2018 series entitled: "Outcomes Analysis, Quality Improvement, and Patient Safety".

(Ann Thorac Surg 2018;106:1603–11)

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The Society of Thoracic Surgeons (STS) National Database includes four major component databases: the STS Adult Cardiac Surgery Database (ACSD), the STS Congenital Heart Surgery Database (CHSD), the STS General Thoracic Surgery Database (GTSD), and the STS Intermacs Database. In December 2015, *The Annals of Thoracic Surgery* began publishing a monthly series of scholarly articles entitled: "Outcomes Analysis, Quality Improvement, and Patient Safety" [1–33]. In 2018, seven of the articles that appeared in this series were derived from the STS National Database [25, 27, 29, 30, 31, 33]: three articles on outcomes and quality (one each from ACSD, CHSD, and GTSD) [25, 27, 29], three articles on research (one each from ACSD, CHSD, and GTSD) [30, 31, 33], and this final summary article entitled: "The Society of Thoracic Surgeons National Database 2018 Annual Report". Three additional articles on topics related to patient safety were also included in the 2018 series of articles [26, 28, 32]. This final article in the 2018 series provides an annual summary of the status of the STS National Database as of October 2018 and a brief description of the 2018

articles from this series that pertain to the STS National Database.

## STS National Database: Outcomes and Quality

Data from the STS National Database are reported back to participants in Feedback Reports, which facilitate benchmarking individual institutional outcomes to national aggregate data. Table 1 provides information about the size and penetration of three of the major component databases of the STS National Database [34–36]. Table 2 documents the distribution of international participants in the STS National Database. Selected national aggregate outcomes of the more commonly performed operations in STS ACSD, STS CHSD, and STS GTSD are provided in Tables 3, 4, and 5, respectively [2, 4, 6, 14, 16, 18, 25, 27, 29, 37, 38]. Figures 1, 2, and 3 document the number of programs located in each state in the United States that participate in STS ACSD, STS CHSD, and STS GTSD, respectively, as of June 1, 2018.

Consistent with the commitment of STS to accountability and transparency, STS publicly reports cardiothoracic surgical outcomes on the STS website (<http://publicreporting.sts.org/>) for institutions that volunteer to report their data publicly (Table 6). All STS publicly reported measures are endorsed by the National Quality

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Table 1. STS National Database Participation

Variable	STS Adult Cardiac Surgery Database <sup>a</sup>	STS Adult Cardiac Anesthesia Component <sup>a</sup>	STS Congenital Heart Surgery Database <sup>a</sup>	STS Congenital Cardiac Anesthesia Module <sup>a,b</sup>	STS General Thoracic Surgery Database <sup>a</sup>
Participants <sup>c</sup> in United States	1,079	65	115	61	311
Hospitals <sup>d</sup> in United States	1,120	69	135	77	375
Surgeons in United States	2,966	576 (anesthesiologists)	406	610 (anesthesiologists)	1,021
Operations <sup>e</sup> in United States	6,610,348	47,412	461,758	123,924	555,113
States in United States	50 states and Washington, DC	29	40 states and Washington, DC	30 states and Washington, DC	44
Estimated penetration at the hospital level in United States	>90%–95% of hospitals that perform adult heart operations in the United States <sup>f</sup>	...	>95% of hospitals that perform pediatric heart operations in the United States <sup>g</sup>	61.6% <sup>h</sup>	25% <sup>h</sup>
Percentage of programs in United States and Canada that consented to voluntarily publicly report (as of October 1, 2018)	65.4	Public reporting is not available	75.6	Public reporting is not available	27.2
Total countries (including United States) <sup>i</sup>	11	2	5	3	4
Participants <sup>c</sup> outside United States	32	2	8	2	3
Hospitals <sup>d</sup> outside United States	32	2	8	2	3
Surgeons outside United States	171	51 (anesthesiologists)	30	12 (anesthesiologists)	12
Operations <sup>e</sup> outside United States	62,291	0	13,635	0	931
Total participants <sup>c</sup>	1,111	67	123	63	314
Total hospitals <sup>d</sup>	1,152	71	143	79	378
Total surgeons	3,137	627 (anesthesiologists)	436	622 (anesthesiologists)	1,033
Total operations <sup>e</sup>	6,672,639	47,412	475,393	123,924	556,044

<sup>a</sup> All data in Table 1 was updated on September 24, 2018, except for the data about Public Reporting, which was updated on October 1, 2018. <sup>b</sup> The Society of Thoracic Surgeons (STS) Congenital Cardiac Anesthesia Module was developed jointly by STS and Congenital Cardiac Anesthesia Society. <sup>c</sup> An STS Database Participant is usually either a “hospital’s cardiothoracic surgery department” or a “practice group of cardiothoracic surgeons”. Uncommonly, an STS Database Participant is an individual cardiothoracic surgeon. In most instances, an STS Database Participant is a hospital cardiac or thoracic surgery program. <sup>d</sup> In most situations, one STS Database Participant is linked to one hospital; however, in some instances, one STS Database Participant is linked to more than one hospital or one hospital is linked to more than one STS Database Participant. Therefore, the number of STS Database Participants and the number of hospitals is slightly different. <sup>e</sup> Total number of operations in STS Adult Cardiac Surgery Database (ACSD) refers to the total number of operations captured in STS ACSD since its formation in 1989. Total number of operations in STS Congenital Heart Surgery Database (CHSD) and STS General Thoracic Surgery Database (GTSD) refers to the total number of operations in STS CHSD and STS GTSD since these databases began storing data at Duke Clinical Research Institute (DCRI) in 1998. DCRI is the data warehouse and analytic center for ACSD, CHSD, and GTSD. <sup>f</sup> Center-level penetration (number of Centers for Medicare & Medicaid Services [CMS] CABG sites with at least one matched STS participant divided by the total number of CMS coronary artery bypass grafting [CABG] sites) increased from 45% in 2000 to 90% in 2012. In 2012, 973 of 1,081 CMS CABG sites (90%) were linked to an STS site. Patient-level penetration (number of CMS CABG hospitalizations done at STS sites divided by the total number of CMS CABG hospitalizations) increased from 51% in 2000 to 94% in 2012. In 2012, 71,634 of 76,072 CMS CABG hospitalizations (94%) occurred at an STS site. Completeness of case inclusion at STS sites (number of CMS CABG cases at STS sites linked to STS records divided by the total number of CMS CABG cases at STS sites) increased from 88% in 2000 to 98% in 2012. In 2012, 69,213 of 70,932 CMS CABG hospitalizations at STS sites (97%) were linked to an STS record. Data from Jacobs and colleagues [34]. <sup>g</sup> The 2015 Society of Thoracic Surgeons Congenital Heart Surgery Practice and Manpower Survey estimates that 125 hospitals perform pediatric cardiac operations in the United States and 8 hospitals perform pediatric cardiac operations in Canada [35]. <sup>h</sup> Center-level penetration (number of CMS lobectomy sites with at least one matched STS participant divided by the total number of CMS lobectomy sites) increased from 1.2% in 2002 to 25% in 2013. In 2013, 169 of 675 CMS lobectomy sites (25%) were linked to an STS site. Patient-level penetration (number of CMS lobectomy hospitalizations done at STS sites divided by the total number of CMS lobectomy hospitalizations) increased from 2.2% in 2002 to 38% in 2013. In 2013, 4,177 of 11,018 CMS lobectomy hospitalizations (38%) occurred at an STS site. Completeness of case inclusion at STS sites (number of CMS lobectomy cases at STS sites linked to STS records divided by the total number of CMS lobectomy cases at STS sites) increased from 59.6% in 2003 to 77.6% in 2013. In 2013, 3,240 of 4,177 CMS lobectomy hospitalizations at STS sites (77.6%) were linked to an STS record. Data from Tong and colleagues [36]. <sup>i</sup> Countries that participate in the STS Adult Cardiac Surgery Database are United States (50 states and Washington, DC), Canada, Argentina, Australia, Brazil, Cayman Island, Israel, Italy, Saudi Arabia, Turkey, and United Arab Emirates. Countries participating in the STS Congenital Heart Surgery Database are United States (40 states and Washington, DC), Canada (3 Canadian provinces), India, Israel, and Singapore. Countries participating in the STS General Thoracic Database are United States (44 states), Israel, Singapore, and United Arab Emirates.

Data are expressed as number, unless otherwise specified.

Table 2. International Participants in STS National Database<sup>a,b</sup>

Country	STS Adult Cardiac Surgery Database	STS Congenital Heart Surgery Database	STS General Thoracic Surgery Database
Argentina	1	...	...
Australia	1	...	...
Brazil	2	...	...
Cayman Island	1	...	...
India	...	1	...
Israel	13	2	1
Italy	1	...	...
Saudi Arabia	1	...	...
Singapore	...	1	1
Turkey	1	...	...
United Arab Emirates	1	...	1
Total	22	4	3

<sup>a</sup> Data were updated September 24, 2018. <sup>b</sup> Canada is not considered an international participant. Canadian data are included in the aggregate data sets of the STS National Database. Currently, the STS Adult Cardiac Surgery Database and the STS Congenital Heart Surgery Database both have Canadian participants. Currently, the STS General Thoracic Surgery Database does not have Canadian participants.

STS = The Society of Thoracic Surgeons.

Forum. At the time of this publication, the following measures are publicly reported by STS: STS Isolated Coronary Artery Bypass Grafting (CABG) Composite Performance Measure, STS Isolated Aortic Valve Replacement (AVR) Composite Performance Measure,

STS AVR + CABG Composite Performance Measure, STS Risk-Adjusted Operative Mortality for Pediatric and Congenital Heart Surgery, and STS Lobectomy for Lung Cancer Composite Performance Measure. Public reporting of the STS Mitral Valve Replacement or Mitral Valve Repair (MVR) Composite Performance Measure [39] and the STS MVR + CABG Composite Performance Measure [40] is planned for January 2019, and public reporting of the STS Esophagectomy for Esophageal Cancer Composite Performance Measure [41] is planned for Summer 2019. In STS ACSD, these publicly reported measures are reported at the level of the hospital and at the level of the Participant Surgery Group. In STS CHSD, these publicly reported measures are reported at the level of the hospital. In STS GTSD, these publicly reported measures are reported at the level of the Participant Surgery Group.

### STS National Database: Intermacs Database and Pedimacs Database

The STS Intermacs Database became part of the STS National Database on January 1, 2018 (<https://www.sts.org/registries-research-center/sts-national-database/sts-intermacs-database>). Intermacs was established in 2005 at the University of Alabama at Birmingham and is a joint effort among the National Heart, Lung, and Blood Institute of the National Institutes of Health; the Food and Drug Administration; the Centers for Medicare & Medicaid Services; and others. Intermacs is a North American registry designed to acquire data and provide risk-adjusted and feedback data about the clinical outcomes of patients who receive a mechanical circulatory support device

Table 3. Selected Outcomes of the More Commonly Performed Adult Cardiac Surgical Procedures in Calendar Year 2016<sup>a</sup>

Variable	CABG	AVR	AVR + CABG	MVR	MVR + CABG	MV Repair	MV Repair + CABG
No. of operations	156,931	28,037	17,196	7,592	2,885	8,619	3,464
Mortality, %							
In-hospital mortality	1.7	1.6	2.7	4.1	8.3	0.9	4.0
Operative mortality <sup>b</sup>	2.2	2.2	3.3	4.9	9.5	1.1	4.6
Major morbidity, %							
Reoperation <sup>c</sup>	2.3	4.8	6.2	7.8	10.6	3.7	6.9
DSWI/mediastinitis	0.3	0.1	0.3	0.2	0.5	0.1	0.3
Permanent stroke	1.3	1.4	2.2	2.4	3.1	1.1	2.8
Prolonged ventilation >24 hours	7.9	6.6	11.9	17.1	28.1	4.6	18.9
Renal failure	2.1	1.9	3.6	4.3	8.2	1.1	4.8
New-onset atrial fibrillation	24.9	31.3	39.1	33.0	45.9	29.9	43.2
Readmission ≤ 30 days of discharge	10.0	9.8	12.2	15.1	17.0	8.8	13.7
Postoperative hospital LOS, days							
Mean	6.9	7.0	8.4	10.0	11.5	6.3	9.9
Median	6.0	6.0	7.0	7.0	9.0	5.0	8.0

<sup>a</sup> Selected outcomes of the more commonly performed adult cardiac surgical procedures in calendar year 2017 will be published in the January 2019 article of *The Annals of Thoracic Surgery* series entitled: “Outcomes Analysis, Quality Improvement, and Patient Safety”. <sup>b</sup> Operative mortality is defined in all Society of Thoracic Surgeons databases as (1) all deaths, regardless of cause, occurring during the hospitalization in which the operation was performed, even if after 30 days (including patients transferred to other acute or short-term care facilities) and (2) all deaths, regardless of cause, occurring after discharge from the hospital, but before the end of the 30th postoperative day [37, 38]. <sup>c</sup> National Quality Forum definition of reoperation.

AVR = aortic valve replacement; CABG = coronary artery bypass grafting; DSWI = deep sternal wound infection; LOS = length of stay; MV = mitral valve; MVR = mitral valve replacement.

Table 4. Selected Outcomes of the More Commonly Performed Pediatric and Congenital Cardiac Surgical Procedures in the Four-Year Analytic Window of Calendar Years January 2013 to December 2016<sup>a</sup>

Variable	Off Bypass Coarctation	VSD	TOF	AVC	ASO	ASO + VSD	Glenn/HemiFontan	Fontan	Truncus	Norwood
No. of operations	3,949	7,322	4,735	3,219	1,879	782	4,538	4,252	621	2,783
Operative mortality, <sup>b</sup> %	1.3	0.6	1.1	2.7	2.2	5.1	2.1	1.1	10.1	15.8
Aggregate average postoperative LOS per patient, days	12.5	8.5	11.9	16.9	16.8	19.1	14.3	13.6	33.5	45.7
Median participant-specific average postoperative LOS, days	11.3	8.3	11.5	16.6	16.8	16.4	13.3	13.6	28.7	43.7

<sup>a</sup> Selected outcomes of the more commonly performed congenital and pediatric cardiac surgical procedures in calendar years 2014 to 2017 will be published in the March 2019 article of *The Annals of Thoracic Surgery* series entitled: "Outcomes Analysis, Quality Improvement, and Patient Safety". <sup>b</sup> Operative mortality is defined in all Society of Thoracic Surgeons databases as (1) all deaths, regardless of cause, occurring during the hospitalization in which the operation was performed, even if after 30 days (including patients transferred to other acute or short-term care facilities) and (2) all deaths, regardless of cause, occurring after discharge from the hospital, but before the end of the 30th postoperative day [37, 38].

ASO = arterial switch operation; AVC = atrioventricular canal repair; LOS = length of stay; TOF = tetralogy of Fallot repair; VSD = ventricular septal defect repair.

Table 5. Selected Outcomes of the More Commonly Performed General Thoracic Surgical Procedures in the Three-Year Analytic Window of January 1, 2015, to December 31, 2017<sup>a</sup>

Variable	Wedge Resection	Segmentectomy	Lobectomy	Pneumonectomy	Esophagectomy
No. of operations	20,344	4,384	37,091	1,527	7,310
Operative mortality, <sup>b</sup> %	0.8	1.1	1.3	6.7	3.5
Median postoperative length of stay, days	2.0	3.0	4.0	5.0	10

<sup>a</sup> Data from 26th Data Analysis of The Society of Thoracic Surgeons General Thoracic Surgery Database (ie, 2018 Spring Harvest Feedback Report, Tables 10 to 14; time window: January 1, 2015, to December 31, 2017). <sup>b</sup> Operative mortality is defined in all Society of Thoracic Surgeons databases as (1) all deaths, regardless of cause, occurring during the hospitalization in which the operation was performed, even if after 30 days (including patients transferred to other acute or short-term care facilities) and (2) all deaths, regardless of cause, occurring after discharge from the hospital, but before the end of the 30th postoperative day [37, 38].

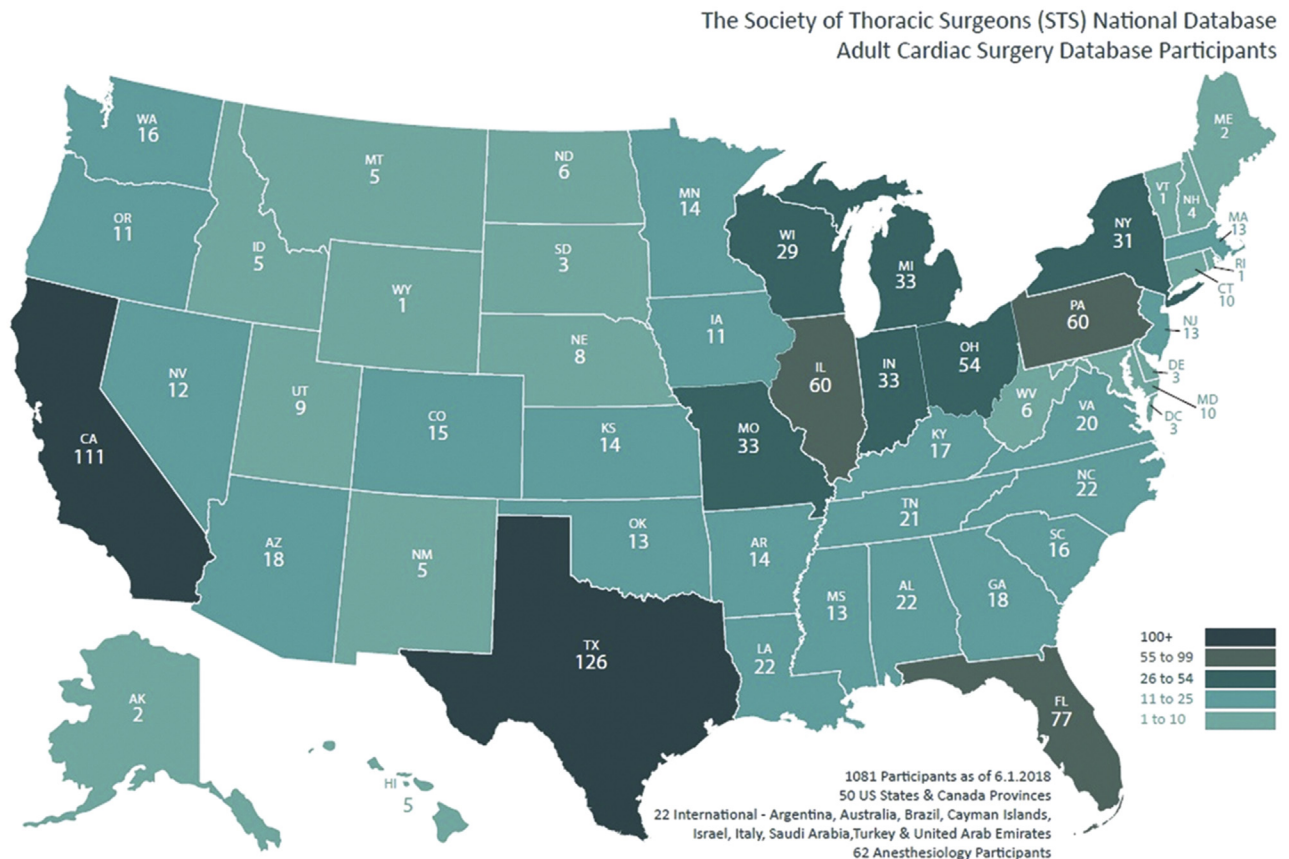


Fig 1. Number of programs located in each state in the United States that participate in STS Adult Cardiac Surgery Database, as of June 1, 2018.

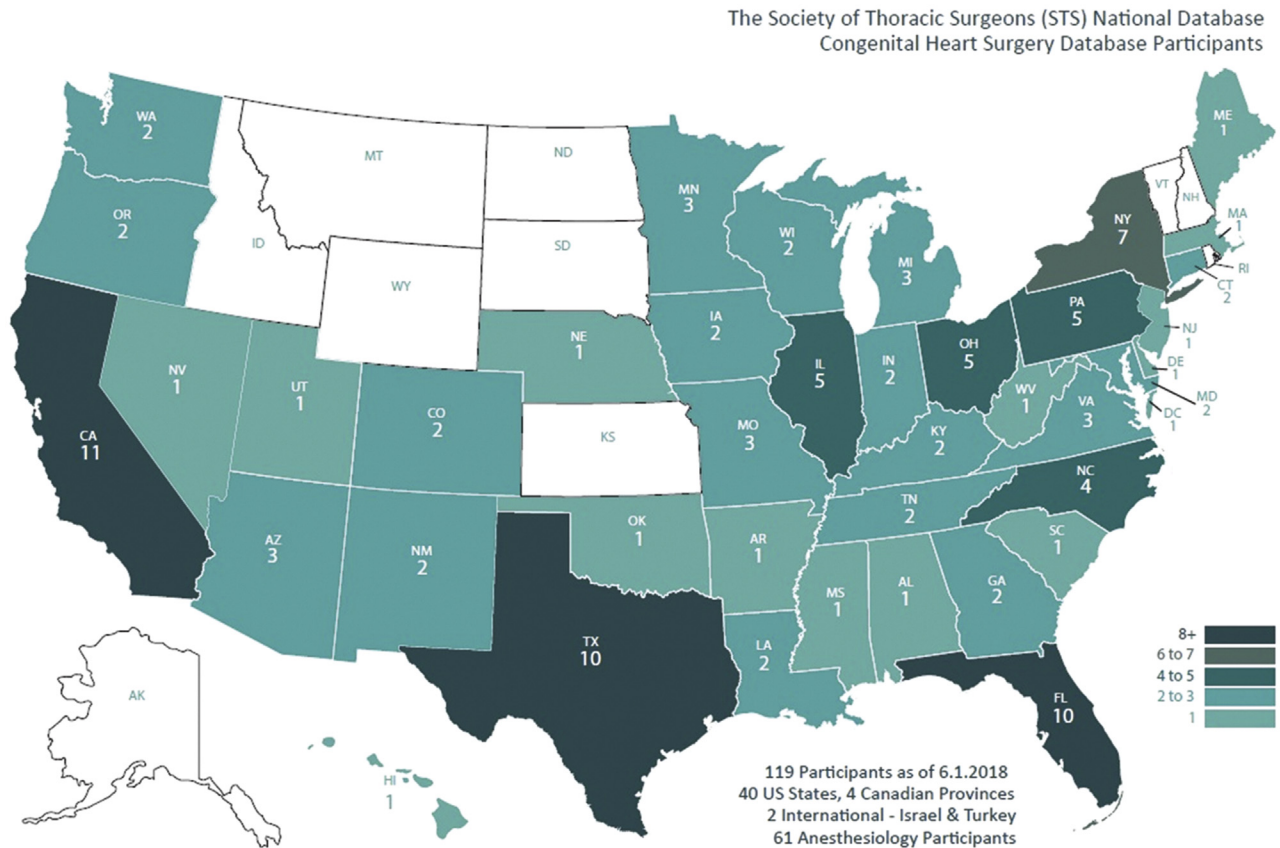


Fig 2. Number of programs located in each state in the United States that participate in STS Congenital Heart Surgery Database, as of June 1, 2018.

approved by the Food and Drug Administration to treat advanced heart failure. The STS InterMACs Database represents the next generation of InterMACs.

Pedimacs (<https://www.uab.edu/medicine/intermacs/pedimacs>) is the pediatric portion of InterMACs. Although InterMACs has always included durable devices implanted in pediatric patients, Pedimacs has been developed to focus on capturing data elements unique to pediatric patients. Pedimacs evaluates special issues in the pediatric population receiving mechanical circulatory support device therapy, differences in devices available, and the particular pediatric population for whom this therapy may be most effective. Both STS InterMACs Database and STS Pedimacs Database include longitudinal data for the life of a patient with a mechanical circulatory support device.

### STS National Database: Ongoing Quality Initiatives

STS supports multiple ongoing initiatives designed to improve the quality of cardiothoracic surgery. The STS Quality Measurement Task Force (QMTF) develops official STS risk models and performance measures. This process involves close collaboration between clinical cardiothoracic surgeons and statisticians from Duke Clinical Research Institute. Table 7 summarizes recently

completed, ongoing, and future QMTF initiatives, some of which are highlighted in the sections below.

#### QMTF ACSD Initiatives

STS QMTF has just completed and published the first complete update of its adult cardiac surgery risk models since the 2008 version, which was published in 2009 [42–44]. Previously, these 2008 models were simply recalibrated with each data harvest so that the aggregate expected number of events exactly matched the aggregate observed number of events during that harvest, resulting in an observed-to-expected ratio of 1. The performance of the 2018 ACSD risk models is almost uniformly superior to that of previous models (ie, discrimination of all 2018 models, as assessed by the c-index, was superior to that of 2008 models except for the stroke model for valve patients [45, 46]). QMTF is also using its STS MVRR Composite Performance Measure [39] and the STS MVRR + CABG Composite Performance Measure [40] to explore the potential association of site-level mitral procedural volume (including a possible volume–outcome inflection point) with survival, rehospitalization, reintervention, and the likelihood of mitral repair versus replacement. Finally, QMTF is developing a multi-procedural (isolated CABG, isolated AVR, MVRR, AVR + CABG, MVRR + CABG procedures, and multiple valve procedures), multi-domain Center-Level Composite

The Society of Thoracic Surgeons (STS) National Database  
General Thoracic Surgery Database Participants

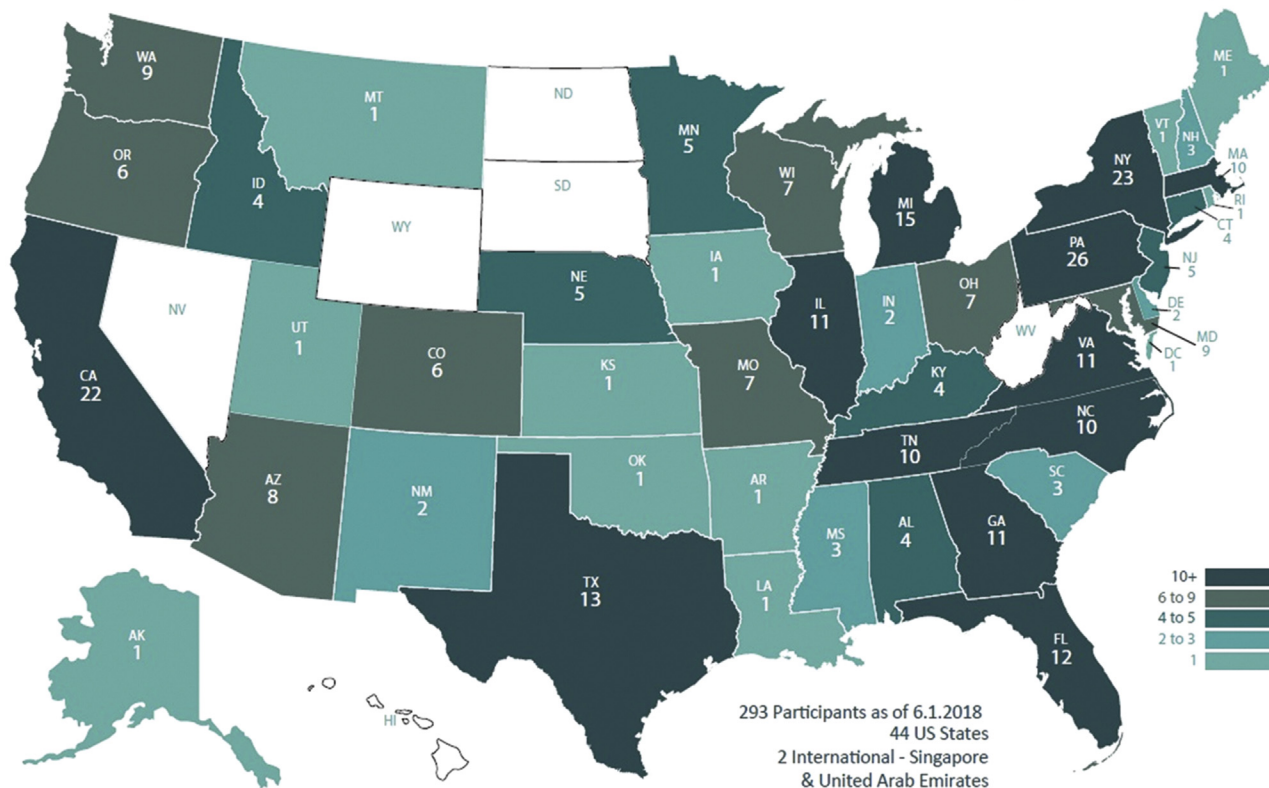


Fig 3. Number of programs located in each state in the United States that participate in STS General Thoracic Surgery Database, as of June 1, 2018.

Performance Measure for STS ACSD Participants (typically hospital departments or practice groups), which would be quite similar to the STS multi-procedural (isolated CABG, isolated AVR, MVRR, AVR + CABG, and MVRR + CABG procedures), multi-domain Individual Surgeon Composite Performance Measure [47]. The only major methodological difference between the STS multi-procedural, multi-domain Individual Surgeon Composite Performance Measure and the new STS multi-procedural, multi-domain Center-Level Composite Performance Measure will be the addition of multiple valve procedures as a sixth procedural group; consequently, QMTF is now updating its previously published multiple valve model [48] and developing an STS Multiple Valve Composite Performance Measure.

Table 6. Participation in Voluntary Public Reporting With the STS National Database

Database	Enrolled, %	Unique STS Consents/ US and Canada Participants (as of Monday, October 1, 2018)
Adult cardiac	65.4	713/1,089
Congenital	75.6	90/119
Thoracic	27.2	85/312

STS = The Society of Thoracic Surgeons.

### QMTF CHSD Initiatives

In 2018, STS published the STS Pediatric and Congenital Heart Surgery Composite Quality Measure, which includes two domains: risk-adjusted mortality and morbidity [49, 50]. This metric is the first composite quality measure for pediatric and congenital cardiac surgery and provides a more comprehensive view of quality than mortality alone. By increasing the number of end points, this measure has greater ability to discriminate hospital performance. In the future, this composite measure and its individual components will be included in STS CHSD Feedback Reports to participating centers and will likely be reported publicly by those hospitals that volunteer to participate in STS Public Reporting Online (<https://publicreporting.sts.org/>). In addition, in 2018, STS QMTF completed an upgrade of the STS Pediatric and Congenital Heart Surgery Mortality Risk Model, with the addition of more granular risk adjustment for chromosomal abnormalities, syndromes, and noncardiac congenital anatomic abnormalities [51]. STS QMTF has now embarked on an update of the existing STAT Mortality Categories and the existing STAT Mortality Score [52]. (The STAT Mortality Score is an empirically based index that can be used to identify the statistically estimated risk of in-hospital mortality by procedure and to group procedures into risk categories. Each procedure was assigned a numeric score, ranging from 0.1 to 5.0, based on the estimated

Table 7. Quality Measurement Task Force: Recently Completed, Ongoing, and Future Quality Measurement Task Force Major Projects, 2018 to 2019

Project	Recently Completed	Ongoing	Future
STS Adult Cardiac Surgery Database	STS multi-procedural, multi-domain Individual Surgeon Composite Performance Measure [47]	Association of center-level volume with short- and long-term outcomes (survival, freedom from rehospitalization, freedom from reintervention) and mitral repair rates and for patients with degenerative or annular disease	Risk models for thoracic aortic procedures (when adequate data available)
	Update of STS ACSD Risk Models [45, 46]	STS Multiple Valve Composite Performance Measure	Comparison of published results from public reporting states with STS Composite Performance Measure and Star Ratings for voluntarily reporting programs
	...	STS multi-procedural, multi-domain Center-Level Composite Performance Measure	Alternate reporting formats for Star Ratings
	...	Risk models for postoperative stroke after CABG and AVR	Atrial fibrillation risk model
	...	...	Validation of STS record linking methodology
	...	...	Temporal consistency of Star Ratings
	...	...	Impact of census-tract or block-level socioeconomic factors on STS risk models
	...	...	Risk-adjusted costs in adult cardiac surgery
STS Congenital Heart Surgery Database	Development of a Pediatric and Congenital Heart Surgery Composite Quality Metric [49, 50]	Update of the existing STAT Mortality Categories and the existing STAT Mortality Score	Association of center-level volume and surgeon-level volume with outcome
	Update of STS Pediatric and Congenital Heart Surgery Mortality Risk Model with the addition of more granular risk adjustment for chromosomal abnormalities, syndromes, and noncardiac congenital anatomic abnormalities [51]	...	...
STS General Thoracic Surgery Database	STS Esophagectomy for Esophageal Cancer Composite Performance Measure [41]	Redesign of existing lung cancer resection measure as weighted two-domain composite with Star Rating	...

ACSD = Adult Cardiac Surgery Database; AVR = aortic valve replacement; CABG = coronary artery bypass grafting; QMTF = Quality Measurement Task Force; STS = The Society of Thoracic Surgeons.

mortality rate. Procedures were then sorted by increasing risk and grouped into five categories that were chosen to be optimal for minimizing within-category variation and maximizing between-category variation [52].) This project, which will continue into 2019, will update the current STAT Mortality Scores and STAT Mortality Categories. The updated STAT Mortality Scores and STAT Mortality Categories will use operative mortality [37, 38] as an end point (rather than only in-hospital mortality) and will also improve the assignment of STAT Mortality Scores and STAT Mortality Categories for multi-procedural operations, with a particular focus on procedure combinations for which the estimated risk of mortality is substantially different from that of the individual component procedure with the highest risk.

### QMTF GTSD Initiatives

Due in part to feedback received during National Quality Forum review of the STS Lung Resection for Lung Cancer measure, this measure is being redesigned as a weighted two-domain composite with a star rating, comparable in structure to the STS Lobectomy for Lung Cancer Composite Performance Measure [53], but including a wider range of procedures.

### Summary

The 2018 series of articles in *The Annals of Thoracic Surgery* entitled: “Outcomes Analysis, Quality Improvement, and Patient Safety” [25, 27–33, 35] included (1) three articles on outcomes and quality (one each from ACSD, CHSD, and GTSD) [25, 27, 29], (2) three articles on research (one each from ACSD, CHSD, and GTSD) [30, 31, 33], (3) three articles on topics related to patient safety [26, 28, 32], and (4) this final annual summary article entitled: “*The Society of Thoracic Surgeons National Database 2018 Annual Report*”. The 2019 series of articles in *The Annals of Thoracic Surgery* entitled: “Outcomes Analysis, Quality Improvement, and Patient Safety” will include (1) three articles on outcomes and quality (one each from ACSD [January 2019], CHSD [March 2019], and GTSD [May 2019]), (2) three articles on research (one each from ACSD [July 2019], CHSD [September 2019], and GTSD [November 2019]), (3) articles derived from the STS InterMACs Database (February 2019) and the STS Pedimacs Database (April 2019), (4) an article from the STS Aortic Surgery Database Task Force (June 2019), (5) an article about diversity in cardiothoracic surgery (August 2019), (6) an article related to patient safety (October 2019), and (7) a final summary article entitled: “*The Society of Thoracic Surgeons National Database 2019 Annual Report*” (December 2019).

The STS National Database is one of the leading clinical registries in the world. All four component databases of the STS National Database support outcomes analysis, quality improvement, and research. This Outcomes Analysis, Quality Improvement, and Patient Safety series of articles has allowed STS and our Workforces on National Databases, Research Development, and Patient Safety to convey timely summaries of important topics related to outcomes, quality, and safety.

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The authors wish to thank the following individuals for their important contributions to The Society of Thoracic Surgeons (STS) National Database, to this series of articles, and to this summary article: Donna McDonald, RN, MPH, Susan Becker, MBA, RN-BC, and Robert H. Habib, PhD, The Society of Thoracic Surgeons, Chicago, IL; Sean M. O'Brien, PhD, Shannon Carr, Leo Brothers, MPH, Sreekanth Vemulapalli, MD, Kevin D. Hill, MD, MS, and J. Matthew Brennan, MD, Duke Clinical Research Institute, Duke University, Durham, NC; Sara K. Pasquali, MD, University of Michigan, Ann Arbor, MI; Fred H. Edwards, MD, University of Florida College of Medicine, Jacksonville, FL; Cameron D. Wright, MD, Massachusetts General Hospital, Harvard Medical School, Boston, MA; Gaetano Paone, MD, Henry Ford Hospital, Detroit, MI; Joseph C. Cleveland, Jr, MD, and Frederick L. Grover, MD, University of Colorado, School of Medicine, Aurora, CO; Joseph E. Bavaria, MD, Division of Cardiovascular Surgery, University of Pennsylvania, Philadelphia, PA; and Richard L. Prager, MD, Cardiac Surgery Department, University of Michigan, Ann Arbor, MI. The members of the STS Workforce on National Databases, the STS Workforce on Research Development, and the STS Workforce on Patient Safety would like to thank G. Alexander Patterson, MD, the Editor-In-Chief of *The Annals of Thoracic Surgery*, for the opportunity to publish this monthly series of articles.

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