



The Society of Thoracic Surgeons Adult Cardiac Surgery Database: 2017 Update on Outcomes and Quality

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Established in 1989, The Society of Thoracic Surgeons Adult Cardiac Surgery Database is one of the most comprehensive clinical data registries in health care. It is widely regarded as the gold standard for benchmarking risk-adjusted outcomes in cardiac surgery and is the foundation for all quality measurement and improvement activities of The Society of Thoracic Surgeons. This is the

second in a series of annual reports that summarizes current aggregate national outcomes in cardiac surgery and reviews database-related activities in the areas of quality measurement and performance improvement during the past year.

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The Society of Thoracic Surgeons (STS) Adult Cardiac Surgery Database (ACSD) was established in response to the publication of minimally adjusted coronary artery bypass grafting (CABG) operative mortality data by the federal government in 1986 and the recognition by STS leaders that these results did not adjust for differences in the inherent risk of patients [1, 2]. Since its inception in 1989, the primary goal of the ACSD has been to provide clinically relevant and accurate information to STS participants to assist in self-assessment and quality improvement activities.

During the past 3 decades, the ACSD has evolved into the most comprehensive clinical cardiac surgery data registry in the world. Data derived from this repository of more than 6.1 million patient records support nationally benchmarked performance assessment and feedback, sophisticated risk adjustment models [3–5], performance measurement [6, 7], quality improvement initiatives, and voluntary public reporting [8]. The ACSD has also been linked with other registries, facilitating the development of a platform for longitudinal outcomes assessment to inform comparative effectiveness research, device surveillance, and health policy development. This report summarizes current national aggregate cardiac surgical outcomes and outlines quality measurement and performance improvement activities derived from the ACSD during the past year.

Overview of the ACSD

ACSD participants submit data to the STS data warehouse and analytical center at Duke Clinical Research Institute during four quarterly harvests each year. After internal checks for data completeness and consistency are conducted, analyses are performed, and the results are disseminated quarterly to each ACSD participant. The information is participant specific regarding risk factors and nationally benchmarked outcomes and also contains aggregate national results for comparison and internal quality assurance. Semiannually, participants also receive their performance on National Quality Forum (NQF)-endorsed STS measures and composite quality scores based on a running 12 months (CABG) and 36 months (valve) of data ending in June or December of each year.

As of September 2016, the ACSD included 1,119 participant groups comprising 3,100 surgeons from all 50 United States states, 10 sites in Canada, and 19 participants in 7 other countries. The data set contains information on more than 6.1 million cumulative cardiac operations worldwide. The anesthesiology module has 62 participants comprising 684 anesthesiologists. The atrial fibrillation module has 15 participants. Linked Centers for Medicare and Medicaid Services and ACSD CABG data have demonstrated high ACSD patient (94%) and center-level (90%) penetration and 98% complete case inclusion of Centers for Medicare and Medicaid Services CABG cases at STS sites [9]. These findings provide reassuring information about the representativeness and completeness of the ACSD.

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Abbreviations and Acronyms

ACSD	= Adult Cardiac Surgery Database
AF	= atrial fibrillation
AVR	= aortic valve replacement
CABG	= coronary artery bypass grafting
CVA	= cerebrovascular accident
DSWI	= deep sternal wound infection
FTR	= failure to rescue
LOS	= length of stay
MV	= mitral valve
MVR	= mitral valve replacement
MVRR	= mitral valve repair or replacement
NQF	= National Quality Forum
QMTF	= Quality Measurement Task Force
STS	= The Society of Thoracic Surgeons
TQI	= Task Force on Quality Initiatives

Data integrity has been of paramount importance to the ACSD since its inception. In addition to an extensive internal validation process, beginning in 2006, STS has randomly selected 10% of sites each year for additional independent external audit. In 2016, 110 facilities were audited. During an audit, submitted data are compared with the medical record, and hospital surgical logs are reviewed to verify that all cases are included. These audits have shown nearly 100% of cases are appropriately captured and that concordance rates with submitted data elements exceed 95% [10, 11].

Some data fields have a choice of “unknown,” as an option to be used only after every effort has been made to ascertain the correct response. Minimizing the use of “unknown” is particularly critical for those fields relating to operative mortality, because they underpin the validity of risk models, benchmarking, and composite scores. The relevant operative mortality fields include “discharge status,” “status at 30 days after discharge,” and “operative death.” To assure the highest level of accuracy when reporting operative mortality, STS has established “missing” or “unknown” vital status thresholds to determine eligibility to receive a composite score (star rating). As of January 1, 2016, fields relating to operative mortality status must have a completeness rate of 95%, increasing to 98% for those cases performed after December 31, 2016. Records with “unknown” or “missing” operative mortality data are considered incomplete. Patients of STS ACSD participants who do not meet data completeness thresholds will not be included in the benchmark population used for performance analyses, and these participants will not be eligible to receive a composite score.

A key objective of the ACSD is to provide sophisticated risk models that can be used to assess outcomes and quality. Consequently, data elements are revised on a 3-year cycle to ensure they remain clinically relevant with evolving surgical practice and to address suggestions raised by data managers and surgeons. ACSD specification revision was a major focus in 2016 and entailed a systematic review of every data field in version 2.81. With

each specification revision, there is always an inherent tension between collecting every possible relevant factor and increasing the number of data fields beyond a pragmatic size. An expansion pressure is also created by new technologies and procedures.

Mindful of maintaining this balance, outdated data elements have been eliminated in the most recent specification upgrade to permit inclusion of others that better reflect current and future practice. Most notably, the section on aortic and aortic root procedures was rewritten and substantially expanded to address the advances in aortic surgery since the last iteration of the database. The new version, which will become effective July 1, 2017, will contain approximately 1,200 data elements, including those data fields in the optional anesthesiology module. This represents an increase from the 840 fields in version 2.81, although the additional fields required for any given patient are far fewer because many of these data elements are child fields that are only relevant if the parent is selected; furthermore, some data elements apply only to specific types of patients.

National Outcomes in Adult Cardiac Surgery

This report encompasses aggregate outcomes for all operations performed during the period January 1 to December 31, 2015, and presented in the 2016 Harvest 1 report. They are based on the data elements specified in the current version (2.81) of the data collection instrument.

The relative distribution of the major procedures for which the STS ACSD has developed risk-adjustment models [3–5] and composite quality ratings [12–15] is shown in Figure 1. These seven procedures represent approximately 77% of the major cardiac procedures performed nationally. Thus, 23% of procedures performed nationally are not included in one of these seven categories and comprise procedures such as combined aortic and mitral valve replacement, tricuspid valve repair/replacement, arrhythmia correction operations, implantation of a ventricular assist device, and septal defect repair, among others, that were performed in isolation or in combination with other procedures.

Table 1 inventories the change in procedure volume during the past decade and the past year. The number of isolated CABG operations, although declining by 7% during the past decade, has shown a slight increase during the past year. This may reflect a change in the volume or treatment strategy, or both, of diabetic patients presenting with 3-vessel coronary disease. The volume of aortic valve replacements performed during the past decade has increased by 74%. However, that growth trend was notably absent during this past year, with a 1% decrease in the number of procedures, undoubtedly resulting from the effect of transcatheter aortic valve replacement as an emerging treatment option. There is a continuing national trend in favor of mitral valve repair over replacement [15], although the overall number of procedures involving the mitral valve, despite showing growth during the past decade, decreased slightly in 2015.

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