

The Society of Thoracic Surgeons Adult Cardiac Surgery Database: 2016 Update on Outcomes and Quality

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The Society of Thoracic Surgeons Adult Cardiac Database is one of the longest-standing, largest, and most highly regarded clinical data registries in health care. It serves as the foundation for all quality measurement and improvement activities of The Society of Thoracic Surgeons. This report summarizes current aggregate national

outcomes in adult cardiac surgery and reviews database-related activities in the areas of quality measurement and performance improvement.

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The Society of Thoracic Surgeons (STS) Adult Cardiac Surgery Database (ACSD) was established in 1989 as the first component of what has ultimately become the STS National Database. ACSD was initiated in direct response to the publication of minimally adjusted coronary artery bypass grafting (CABG) mortality data by the federal government in 1986 and the resulting concern by the STS leaders that these results did not reflect differences in the inherent risk of patients [1, 2].

During the ensuing quarter century, the STS has progressively refined the ACSD into what has become the preeminent clinical cardiac surgery data registry in the world, now containing more than 5.7 million patient records. These data are used to support nationally benchmarked performance assessment and feedback, sophisticated risk-adjustment models [3–5], quality improvement initiatives, performance measurement [6, 7], voluntary public reporting [8], research, reimbursement strategies, and government and regulatory collaborations. Much of this work has been detailed in more than 150 peer reviewed publications.

This is the first in a series of annual reports summarizing national aggregate cardiac surgical outcomes and detailing quality measurement and performance improvement activities derived from the ACSD during the past year.

Brief Overview of the ACSD

Collection of detailed clinical data and feedback of risk-adjusted nationally benchmarked results to participant groups remain the primary functions of the ACSD. A participant is typically a hospital cardiac surgery program, a practice group of cardiothoracic surgeons, or uncommonly, an individual surgeon. Data are submitted to the STS data warehouse and analytical center at Duke Clinical Research Institute during four quarterly harvests each year, and results are disseminated quarterly to each ACSD participant. These results contain participant-specific information regarding risk factors and nationally benchmarked outcomes as well as 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.

More than 1,300 clinical data elements are available for each patient, although many are “child fields” that are not coded unless the relevant “parent” element is coded. Approximately 225 data elements are coded for a typical CABG patient. To maintain clinical relevance with evolving surgical practice, data elements undergo periodic revision to clarify existing variables, harmonize definitions with related national and international databases, add new variables of interest, and remove irrelevant ones. These revisions are performed on a 3-year cycle.

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Abbreviations and Acronyms

ACSD = Adult Cardiac Surgery Database
 AVR = aortic valve replacement
 CABG = coronary artery bypass grafting
 CMS = Centers for Medicare and Medicaid Services
 FTR = failure to rescue
 MV = mitral valve
 MVR = mitral valve replacement
 MVRR = mitral valve repair or replacement
 NQF = National Quality Forum
 QMTF = Quality Measurement Task Force
 STS = Society of Thoracic Surgeons
 TQI = Task Force on Quality Initiatives

Data integrity is critical to the validity of any clinical database, and the STS uses an internal validation process and external audit. Each year, 10% of sites are randomly selected for an independent external audit. Submitted data elements are validated by comparison with the medical record, and hospital surgical logs are reviewed to verify that all cases are included. These audits have shown nearly 100% completeness of case ascertainment and greater than 95% agreement rates with recorded data elements [9]. Completeness of case inclusion at STS sites has also been corroborated by analyses based on successful linkage of ACSD data with claims data from the Centers for Medicare and Medicaid Services (CMS) [10].

As of September 2015, the ACSD included 1,126 participant groups comprising 2,976 surgeons from all 50 states in the United States and from 8 other countries. Of the 5.7 million cumulative worldwide operations included in the ACSD, more than 5.1 million have been performed in the United States. A recently completed analysis of linked CMS and ACSD CABG data showed the center-level and patient-level penetration of the ACSD in 2012 had reached 90% and 94%, respectively. Furthermore, this study linked 98% of CMS CABG hospitalizations at active STS sites to an STS ACSD record, a very high degree of completeness [11]. These findings suggest that nearly all CMS CABG operations performed at STS sites are captured in the ACSD. Given the predominance of Medicare patients in the CABG population, this is an excellent indicator that the STS ACSD captures the vast majority of cardiac cases in the United States.

I. National Outcomes in Adult Cardiac Surgery

This report encompasses aggregate outcomes for all operations performed from January 1 to December 31, 2014, and presented in the 2015 Harvest 1 report. The outcomes are based on the data elements specified in the current version (2.81) of the data collection instrument.

CABG remains the single most commonly performed major procedure, followed by isolated aortic valve replacement (AVR), combined aortic valve and CABG, mitral valve operations, operations for aortic aneurysm, and combined aortic and mitral valve replacement (MVR)

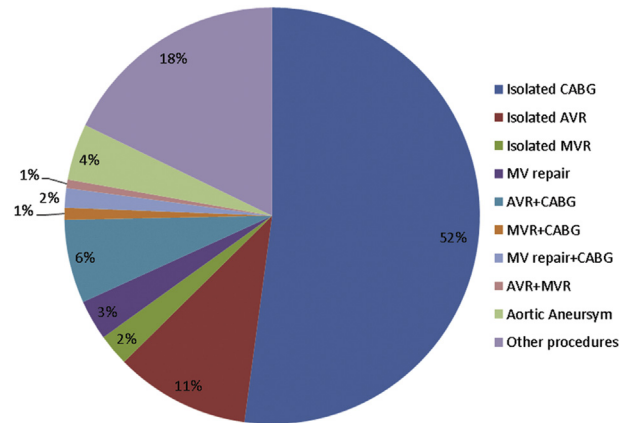


Fig 1. Relative distribution of cardiac operations by procedure type for calendar year 2014. “Other procedures” includes cardiac procedures not classified in the pie chart (ie, tricuspid valve operations, ventricular assist devices, arrhythmia operations, transplants, etc). (AVR = aortic valve replacement; CABG = coronary artery bypass grafting; MV = mitral valve; MVR = mitral valve replacement.)

(Fig 1). Approximately 18% of procedures performed nationally are not included in one of the above categories. These include procedures, such as tricuspid valve repair/replacement, arrhythmia correction surgery, implantation of ventricular assist device, and septal defect repair, among others, that were performed in isolation or in combination with other procedures.

Table 1 details the change in procedure volume during the past decade. The number of isolated CABG operations has decreased by 6%, reflecting the effect of improving medical management and coronary artery stenting. The number of isolated surgical aortic valve replacements demonstrated a dramatic 95% increase during the past decade, from 14,945 to 29,158 operations, probably due to the aging of our population and the “halo effect” of transcatheter aortic valve technology. Similar increases are seen for the other major procedures, with the exception of combined mitral valve repair and CABG, which showed a 7% decline during the same interval. Surgical interventions on the mitral valve have shown a continuing national trend in favor of repair over replacement. From 2011 to 2014, approximately 70% of primary mitral valve procedures involved valve reconstruction across all pathologies [12].

Selected aggregate national outcomes for the more commonly performed operations in calendar year 2014 are presented in Table 2. Among the procedures listed, operative mortality ranges from a low of 1.2% for mitral valve repair to a high of 9.9% for MVR and CABG. MVR+CABG also has the highest incidence of major morbidity, most notably, a 31% incidence of prolonged ventilation beyond 24 hours.

New-onset postoperative atrial fibrillation is the most common complication after cardiac surgery and has detrimental effects on postoperative clinical outcomes, resource utilization, and hospital costs [15]. Despite numerous proposed prophylactic management strategies,

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