The Society of Thoracic Surgeons Adult Cardiac Surgery Database: 2017 Update on Research

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Containing more than 6 million cumulative operative records and accounting for 90% to 95% of adult cardiac surgery performed in the United States, The Society of Thoracic Surgeons Adult Cardiac Surgery Database is an invaluable resource for performance assessment, quality improvement, and clinical research. This article reviews the seven major research efforts published in 2016 that utilized the Adult Cardiac Surgery Database. Two studies evaluated national trends in clinical practice, three assessed the effect of several risk factors on postoperative morbidity and mortality, and two developed new models to evaluate quality of care. The findings of these studies have enhanced clinical practice and delineated areas for future quality improvement research.

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In 1989, The Society of Thoracic Surgeons (STS) Adult Cardiac Surgery Database (ACSD) was developed to provide a more reliable performance assessment by evaluating postoperative outcomes in the context of patient demographics and risk factors [1, 2]. Over the ensuing 3 decades, the ACSD has expanded into the most comprehensive cardiac surgery registry in the world [3]. As of 2017, the database includes more than 6 million cumulative operations performed by 3,017 surgeons from 1,115 practice groups. The ACSD is highly representative of contemporary national trends in cardiac surgery, accounting for 90% to 95% of adult cardiac surgery performed in the United States [4].

The Duke Clinical Research Institute maintains the ACSD, and rigorous internal and external auditing is regularly performed to assure reliability and completeness [2, 3, 5]. Biannual reports are provided by the institute to participating sites that compare individual performance to national benchmarks as determined by review of the ACSD [3, 4].

In collaboration with the Duke Clinical Research Institute, the STS Quality Measurement Task Force (QMTF) utilized the ACSD to develop calculators for predicted risk of mortality (PROM) for major surgical procedures, including coronary artery bypass graft surgery (CABG), and aortic and mitral valve procedures [2, 6–11]. These models are maintained on the STS website for use by surgeons, cardiologists, and patients, and are regularly updated to reflect contemporary data. More recently, the STS QMTF has developed composite performance measures of risk-adjusted mortality and morbidity for major cardiac surgical procedures as a more comprehensive metric of quality of care [3, 6–11].

In addition to the site-specific quality measurement and improvement efforts of the ACSD, its comprehensiveness and accuracy also make the registry an invaluable tool for clinical research affecting changes in practice at the national level. All STS members can submit protocols for clinical research utilizing the ACSD. Collected data include demographics, baseline comorbidities, procedural details, and inhospital to 30-day outcomes. Recently, the ACSD has been linked to the US Centers for Medicare and Medicaid Services claims data, making it possible to perform longer-term outcome analyses for patients 65 years of age or older [12].

This article reviews the major research efforts utilizing the ACSD that were published in 2016. Two studies analyzed patient outcomes in the ACSD to evaluate national trends in clinical practice [13, 14], three studies assessed the effect of several risk factors on

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Abbreviations and Acronyms

ACSD = Adult Cardiac Surgery Database
BMVR = bioprosthetic mitral valve replacement
CABG = coronary artery bypass graft surgery
CI = confidence interval
MCS = mechanical circulatory support
OR = odds ratio
PROM = predicted risk of mortality
QMTF = Quality Measurement Task Force
RA = robotic-assisted
STS = The Society of Thoracic Surgeons

postoperative morbidity and mortality [15–17], and two studies developed new models to evaluate quality of care [18, 19].

Studies Analyzing National Trends in Clinical Practice

One recent study by Whellan and colleagues [13] utilized the ACSD to investigate national trends in the use and outcomes of robotic-assisted (RA) CABG [13]. Robotic-assisted CABG was defined as using robotic grafting or left internal mammary artery harvesting, and included totally endoscopic CABG, minimally invasive direct CABG, and RA-CABG as a component of hybrid coronary revascularization. The investigators identified all non-emergent, elective, isolated CABG procedures utilizing a left internal mammary artery from 2006 to 2012 at 719 sites in the ACSD. Baseline characteristics and outcomes of RA-CABG procedures (n = 9,862) were compared with those not using RA-CABG (n = 956,349). Additionally, the use of RA-CABG within each site during the study period was analyzed.

The number of sites performing RA-CABG was 148 in 2006 and 151 in 2012, and most performed between one and five procedures per year (Fig 1). Only 0.59% of all CABG operations utilized robotics in 2006, with a slight increase to 0.97% in 2012. Patients undergoing robotic procedures were slightly younger (64 versus 65 years, $p < 0.0001$) and had lower rates of baseline comorbidities. Cardiopulmonary bypass was used less frequently with robotic procedures (22.4% versus 80.4%, $p < 0.0001$), and fewer grafts were used (median 1.0 versus 3.0, $p < 0.0001$).

After RA-CABG, major complications occurred less frequently (10.2% versus 13.5%, $p < 0.0001$) and, as expected, the length of postoperative admission was shorter (4 versus 5 days, $p < 0.0001$) compared with nonrobotic procedures. Operative mortality (defined as death within the postoperative hospitalization or after discharge within 30 days of CABG) was not significantly different after adjustment using the STS risk model (odds ratio [OR] 1.10; 95% confidence interval [CI]: 0.93 to 1.30, $p = 0.29$). Moreover, the mortality of RA-CABG was comparable between sites with high volume (more than 20 RA-CABG per year) and low volume (20 or fewer RA-CABG per year), 1.1% versus 1.3% ($p = 0.51$).

That RA-CABG was consistently performed at low volumes and at a limited number of sites during the study period despite similar mortality and decreased morbidity compared with nonrobotic procedures merits further study. Moreover, given the improvements in robotic technology since 2012 and the accompanied resurgence in robotic cardiac operations that have occurred after the study period of this analysis, it would be most interesting to determine how this new technology can be used in contemporary practice to optimize outcomes and resource utilization. A National Heart, Lung, and Blood Institute-sponsored trial comparing hybrid CABG revascularization with multivessel stenting is soon to begin and may shed light on this novel procedure.

Another study, by Schwann and colleagues [14], evaluated the patient characteristics and national variability of surgeon and hospital practice associated with the prescription of warfarin after bioprosthetic mitral valve replacement (BMVR). This analysis included 7,637 patients in the ACSD undergoing isolated, primary, non-emergent BMVR from 2008 to 2011. Patients with

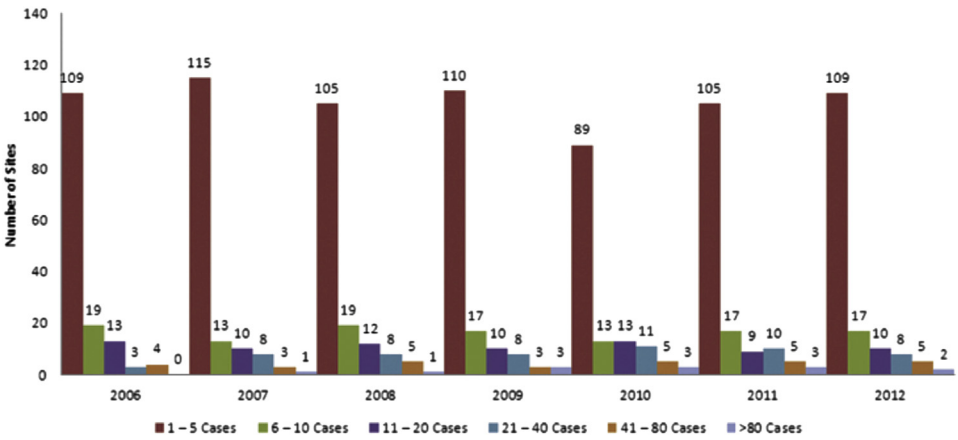

Fig 1. Robot-assisted coronary artery bypass graft surgery (RA-CABG) volume by site from 2006 to 2012. (Red bars = 1 to 5 cases; green bars = 6 to 10 cases; dark blue bars = 11 to 20 cases; turquoise bars = 21 to 40 cases; orange bars = 41 to 80 cases; light blue bars = more than 80 cases.)

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