HHS Public Access

Author manuscript

Ann Thorac Surg. Author manuscript; available in PMC 2021 September 01.

Published in final edited form as:

Ann Thorac Surg. 2020 September ; 110(3): 1082–1090. doi:10.1016/j.athoracsur.2020.04.004.

STS Thoracic Surgery Practice and Access Task Force - 2019 Workforce Report

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Abstract

Background.—The Society of Thoracic Surgeons (STS) has intermittently surveyed its workforce, providing isolated accounts of the current state of thoracic surgical practice.

Methods.—The 70 question survey instrument was received by 3834 STS surgeon members and responses gathered between September 16 and November 1, 2019. There was a 27.9% return rate.

Results.—The median age of the active US thoracic surgeons is 56 years. Women comprise 8.4% of the responders, constituting 6.2 % of adult cardiac, 10.6% of congenital heart, and 12.6% of general thoracic surgeons. The majority of practicing US surgeons (83.5%) graduated from medical school in the US. Survey respondents had 7(21.8%), 8(25.0%), 9(22.1%) or ≥ 10(29.2%) years of post-MD training before entering practice. Educational debt was increased compared to previous years, as was salaries. Overall career satisfaction was 54.1% (very or extremely satisfied), and overall average hours per week worked has decreased compared with past surveys. However, 55.7% of surgeons had symptoms of burnout and depression. STS Database participation was high (90.5%), with the most common reason for not participating being cost (32.6%). Operative volume over the past 12 months decreased for 23.7% of surgeons. 46.9% of responders plan to retire between the age of 66–69 years and a further 25.6% at age 70 or greater.

Conclusions.—These data provide a current, detailed profile of the specialty. Ongoing challenges remain length of training and educational debt. Case volumes, scope of practice, and career satisfaction have remained relatively constant: however, symptoms of burnout and/or depression are common.

Cardiothoracic surgery as a specialty remains strong. Nevertheless, surgeons continue to work in a challenging environment characterized by aging of the workforce, rapid introduction of novel technologies, pressure to embrace minimally invasive treatment strategies, procedural competition from other specialties, decreased reimbursement from

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payers, changing compensation plans mandating increased clinical productivity, depression and burnout, and a looming potential workforce shortage due to anticipated increases in case load in the face of an inadequate cardiothoracic surgical trainee pool. Information regarding these current practice patterns and trends is vital to the decisions made and programs supported by our governing Societies. The Society of Thoracic Surgeons (STS), the world's largest cardiothoracic surgical society, is a not-for-profit organization founded in 1964 representing more than 7,500 surgeons, researchers and allied health care professionals worldwide dedicated to ensuring the best surgical care for patients with diseases of the heart, lungs and other organs in the chest.

In response to the informational needs outlined above, approximately every 5 years a survey has been conducted of the STS membership since 1974 in order to obtain a better understanding of cardiothoracic surgery practice trends in the United States. The *2019 Practice Survey* presented herein was conducted online during October through November of 2019. A total of 3,834 Active and Senior members in the United States were invited to participate and provided with the survey instrument (see Appendix). Members (N=3,834) were invited to participate by an e-mail invitation sent on September 16, 2019. A total of 1,069 responses were received by November 1st, the date the survey was closed. Of these responders, 873 were active members (31.3% of the 2781 active members surveyed) and 196 senior or retired members (18.6% of the senior or retired members surveyed). This sample size of 1,069 out of 3,834 gave a response rate of 27.9%, providing a ± 2.5% margin of error at the 95% confidence level (i.e., 95% confident that responses from the entire 3,834 member cohort would reveal results within a 2.5% variance of those shown in this report).

The survey results are reviewed below. When possible, results from this survey are presented alongside past results from the 2014 [1], 2009 [2], 2005 and 2003 practice surveys for comparison.

Results

Profile of Surgeon Respondents

Surgeons were predominantly male (91.6%), but this percentage has decreased from previous surveys (93.1% in 2014; 95.4% in 2009, and 97.0% in 2005). The average age of surgeons was 56 in 2019, slightly higher than the 54 year average age noted from the 2014 survey. Surgeons were most likely to be 50 to 59 years old (33.7%) or 60 to 70 years old (29.4%). About 25% were 40 to 49 years old, and fewer were 70 or older (7.2%) or less than 40 years old (5.0%).

About two-thirds of practicing US surgeons had graduated between 1980 and 1999 (31.6% in 1990–1999 and 32.2% in 1980–1989). The majority of practicing US surgeons (83.5%) graduated from medical school in the US. Surgeons were more likely to have graduated from the Middle Atlantic, East North Central, and South Atlantic Regions of the US. About 16% of surgeons identified themselves as a graduate of an international medical school.

Two-thirds of surgeons (68.9%) had 7, 8, or 9 years of training (21.8%, 25.0%, and 22.1%, respectively), while 29.2% reported having 10 years of post-MD training prior to entering

practice (Table 1). When asked to indicate what professional degree (Table 2) they earned after obtaining their MD, about 5% of surgeons replied Masters of Business Administration (MBA) (5.8%), Master of Science (5.2%), or Doctor of Philosophy (PhD) (4.5%).

About one-third of practicing US surgeons (32.4%) indicated they had no educational debt when they began active surgical practice. This percentage is similar to previous surveys (34.9% in 2014, 33.7% in 2009, and 38.9% in 2005, Table 3). Among surgeons who had educational debt, the amount of debt varied: 13.2% had $1-$24,999 in debt, 10.6% had $25,000-$49,999 in debt, 8.7% had $50,000-$74,999 in debt, 7.2% had $75,000-$99,999 in debt, 10.0% had $100,000-$149,999 and 17.8% had $150,000 or more at the time they began active surgical practice.

When asked when they began to practice cardiothoracic surgery, excluding military services or residency, most reported 2000–2009 (30.7%), 1990–1999 (30.3%) or 2010-present (19.2%). A smaller percentage began practicing in 1980–1989 (16.6%) or prior to 1980 (3.3%).

Only 8% of surgeons reported they were fully retired (84/1,069). The majority had retired in 2015 or later (49.3%) or 2010 to 2014 (25.3%). Half reported they retired earlier than planned (50.6%). The most common reasons for retiring earlier than planned included “health” (23.5%), “lack of professional satisfaction” (12.3%), or ”other” reasons (14.8%).

Among practicing US surgeons, three-quarters had not deferred retirement (73.5%), which is similar to the proportion of surgeons who deferred retirement in 2009 (72.4%), but less than in 2014 (76.2%) and 2005 (80.5%). About one in 10 practicing US surgeons (9.8%) said they deferred retirement because they have a “high level of career satisfaction,” and less than one in 10 reported the “cannot afford to retire” (7.2%). About half of surgeons (46.9%) indicated they planned to retire from active, full-time cardiothoracic surgery practice at age 65 to 69, while one-quarter (25.6%) planned to retire at age 70 or more.

Practice and Employment

Practicing US surgeons were most likely to report their practice as Hospital-based (44.8%) or Academic (33.6%). A smaller percentage reported Private Practice (13.0%), Government (1.6%) or Other (5.6%).

When asked about the number of hours worked per week, most surgeons reported working between 51 and 80 hours per week (69.5%) with the largest group reporting working 61 to 70 hours per week (29.0%). Overall, surgeon work hours are decreasing, with 14.8% of respondents reporting working 50 hours or less per week, compared with 11.4% in the 2014 survey. Surgeons reported devoting a majority of their time to either clinical care and surgery (77.5%, on average, up from 75.9% in 2014) or administration (10.6%, on average, down from 11.4% in 2014). Additionally, time spent on research and teaching (5.0% and 5.6%, respectively) decreased from the 2014 survey (5.5% and 6.0%, respectively). Call schedules varied; the most common schedule was “1 day on : 2 days off” (18.9%), “1 day on : 1 day off” (17.8%), or “1 day on : 3 days off” (14.8%).

The majority of surgeons felt that STS adequately represented their professional needs “to a large extent,” (32.1%) or “to a moderate extent” (43.7%). Open-ended responses to “If no, why?” varied but included comments about enhancing the profession through education/advocacy or CME opportunities, better reimbursement, lobbying, more consideration of non-academic surgeons, and more.

Most surgeons (93.6%) do not employ physicians who function primarily as first assistants. Two-fifths of surgeons (39.7%) reported having “1 to 3” surgeons in their multi-specialty group and 3 in ten (31.2%) reported having “4 to 6” surgeons in their multi-specialty group. Only 16.6% reported “7 to 10” and 12.5% reported “greater than 10” surgeons in their multi-specialty group. Half of surgeons operate at one hospital (54.7%), while one-third (35.1%) operate at two or more hospitals.

Procedures

Two-fifths of surgeons (39.6%) reported that the total major operative procedures they performed had “remained about the same compared to the prior 12 months” (Table 4). About one-third of respondents (36.7%) indicated their total number of major operative procedures “increased compared to the prior 12 months”. Furthermore, more than half of surgeons (53.8%) reported they experienced “no change” in catheter-based technology volume in the past 12 months.

Among all practicing US surgeons, the most commonly performed procedures were adult cardiac surgery (65.6%), pulmonary surgery (58.9%) and esophageal surgery (34.7%). About 20% performed vascular surgery (21.8%) or congenital heart surgery in the adult (19.0%). Just over 10 percent reported performing congenital heart surgery in the infant and child (Table 5).

When surgeons were asked if they performed any of a series of 20 different procedures (Table 6), the most commonly performed procedures were “MAZE (any technique) for atrial fibrillation” (67.6%), followed by “Off-pump CABG” (45.6%), and “transcatheter aortic valve replacement” (43.7%).

More than half of all surgeons (59.6%) reported performing “20% or less” of cardiac surgery cases using a less invasive approach. For general thoracic surgery, about 30% of surgeons (28.5%) reported they use a less invasive approach “81% or more” of the time.”

Two-thirds of practicing physicians (62.1%) use the STS Risk Calculator for adult cardiac preop consults and 47.4% of respondents felt that increased accountability for quality and outcomes had made them more “risk averse” regarding patient selection for surgery. Half of practicing physicians (48.7%) have not learned a new surgical skill in the past year.

Income

When asked about income, three-fifths of surgeons (60.9%) reported an income of $200,000 to $799,999 per year; in 2014 74.5% of surgeons reported an income of $200,000 to $799,999. The percentage of surgeons reporting an income of $800,000 or more went up from 13.4% in 2014 to 27.0% in 2019 (Table 7).

Among all income categories in 2019, the most commonly chosen income range was $600,000 to 799,000 per year (24.8%). More than half of surgeons (57.7%) reported that their income included a bonus structure, and bonuses were most commonly based on work RVUs (68.9%), quality metrics (64.0%) or "citizenship" (45.6%). When asked about income satisfaction, only 10.9% of surgeons reported they were "not at all satisfied" with their income; the remaining 89.1% reported various levels of satisfaction with their income.

Practice Characteristics & Research

Half of surgeons (54.2%) reported that it had been 0 to 1 years since their practice has last hired a new surgeon, which is similar to previous surveys (percentage reporting "less than 3 years" was 52.8% in 2009 and 57.4% in 2005). When asked if they plan to hire a new surgeon in the next two years, a majority (59.2%) reported that they planned to hire at least one new surgeon. In 2014, 52.3% of surgeons reported their practice planned to hire at least one surgeon in the next 2 years. When asked what they look for when recruiting a new surgeon, two-fifths selected "recent graduate" while the remaining responses were split between "surgeon with special skills" (31.0%) and "experienced surgeon" (30.1%). When asked about the fiscal structure of their institution, 28.1% of respondents stated that their institution had moved to a "funds flow" model, whereas 29.4% of surgeons did not know.

When asked what sort of research they perform, responses were similar to 2014; three-fifths of surgeons (62.0%) reported they perform "clinical research," while one in 10 reported performing "basic science/laboratory research" (9.4%) or "review/meta-analysis epidemiology" (13.1%). One third of surgeons (35.5%) reported "I do not conduct research."

Overall Satisfaction

Overall, half of surgeons (54.1%) reported they were either extremely or very satisfied with their current career (Table 8). The average rating for career satisfaction was 3.5 on a scale where 5 is "extremely satisfied" and 1 is "not at all satisfied." This was slightly higher than ratings from the 2009, and 2014 surveys. However, more than half of practicing surgeons (55.7%) indicated they have felt symptoms of depression or burnout in the past year.

Practice Location

Practicing US surgeons were commonly located in the Middle Atlantic (13.8%), East North Central (15.5%), South Atlantic (20.3%), and West South Central (12.3%) regions of the US. Most practiced in urban (54.8%) or small/medium-sized community settings (24.0%). A smaller percentage practiced in suburban communities (17.1%), while only 4.1% practiced in rural settings. The majority of surgeons reported their institution does not conduct performance testing (85.3%).

Patient Care

Most surgeons (93.6%) are not board certified in critical care. When asked to identify who was primarily responsible for post-operative patient care for five different scenarios, surgeons were most likely to respond 'CT surgeon', followed by 'Intensivist" for "routine ICU patient", "heart transplant patient," "lung transplant patient," and "assist device

patient." For "TAVR/TEVAR patient," surgeons identified the "CT surgeon" as the surgeon primarily responsible, followed by "Cardiologist."

When asked where advanced practice providers work, the majority of surgeons (80.6%) indicated they work in "all of the above" settings, including clinics/scheduling, non-ICUs, operating rooms, and ICUs. A similar percent of surgeons (81.4%) indicated that the hospital provides funding for advanced practice providers.

Database Participation

Most surgeon respondents (90.5%) participate in the STS National Database, slightly higher than the 89.9% reporting participation in the 2014 survey and much higher than the 35.4% reporting participation in the 2009 survey. Among those who do not participate, the primary reason is due to cost (32.6%) or other reasons (47.2%). Among open-ended responses, some indicated their hospital/employer/institution won't pay for the database, they no longer perform surgery, or they do not have a need for the database.

About one-third of practicing US surgeons (36.3%) reported "0 to 1" employees are required to maintain the STS National Database at their institution; half (51.5%) reported that "2 to 3" employees are required to maintain the STS National Database at their institution. Seven in 10 surgeons (71.8%) reported their STS National Database participation was funded by the hospital. About one-third of practicing US surgeons (32.4%) participate in a regional or state outcomes database and most (79.4%) replied "yes" when asked if a single national outcomes database for each discipline within cardiothoracic surgery is sufficient.

Surgeons reported a range of responses when asked about the number of hours per week spent maintaining EHR meaningful use: one-third replied "4 hours or less" (36.2%) and one-third replied "5–8 hours" (33.3%). About half of practicing surgeons (45.5%) replied that the EHR made their work "harder" while one-quarter replied "Easier" (26.2%) and one-quarter replied "Neither easier nor harder" (28.3%). The most commonly used EHR was "Epic" (56.1%), followed by "Cerner" (21.8%). Half of practicing physicians (51.7%) participate in Medicare physician quality reporting through STS, another three in 10 (29.0%) participate through their hospital/group.

Cardiothoracic Surgery Encouragement

Three-fifths of all US practicing cardiothoracic surgeons (68.4%) would encourage their children or grandchildren to go into medicine today. About half (50.3%) would encourage their children or grandchildren to go into cardiothoracic surgery today, higher than in previous surveys. About one in five surgeons (22.0%) have advised a trainee or student not to pursue a career in cardiothoracic surgery. The most common reason cited for advising against a career in cardiothoracic surgery was "work-life balance" (65.2% cited as 'Very important'), followed by lack of jobs (31.4% cited as 'Very important').

Comment

The periodic performance of the STS workforce survey has allowed both a contemporary and comparative assessment of demographic and practice trends, in addition to soliciting

current attitudes of the physician workforce [1–10]. The STS Task Force on Practice and Access has, on an ongoing basis, continued to expand the work that the STS workforce committee has performed since the first report in 1974 [3]. The information extracted from these surveys has allowed our workforce to see and understand the current trends in their practices and the climates in which they work, and has enabled the STS leadership to develop timely, focused programs and policy and to focus advocacy efforts on those which cater to the current needs of the workforce.

The CT surgeon workforce continues to age. The current survey showed an increase in the average age of practicing surgeons by two years compared with the 2014 survey. Numerous reports to date predict a shortage of CT surgeons in the coming years due to increasing retirement of current surgeons, increases in the aged population resulting in more cases to be performed, and the potential for inadequate supply of new surgeons from our current training programs.[11, 12, 13] A recent study by Moffatt-Bruce and colleagues [13] estimated that, taking into account expected surgeon retirement and the current (inadequately low) yearly addition of new surgeons from residency programs, the CT surgery workforce will decline from almost 4000 surgeons in 2010 to less than 2900 in 2035. At the same time, the anticipated case load will increase from approximately 530,000 cases in 2010 to more than 850,000 cases in 2035. This would translate in a 121% increase in case load per surgeon, a situation which is likely not feasible and which warns of a potential crisis ahead.[13] These projections, which likely will will be offset to some extent by the advancement of percutaneous therapies performed by non-surgeons, are of concern. The current survey showed a 59.2% (up from 52.3% in 2014) response rate for practices looking to hire a new surgeon within the next two years. At the time of this writing, CTSnet (www.CTSnet.org) showed 82 openings for cardiothoracic surgeons. Potential solutions to this apparently looming crisis are few, but could include expedited implementation of increased cardiothoracic surgery residency training positions, expansion of American Board of Thoracic Surgery (ABTS) certification eligibility to programs outside of the US, or increased centralization of CT surgical cases to large volume centers as more rural surgeons retire.

As our workforce ages, concern regarding overall surgeon performance will increase. The timing and rates of decline of cognitive and psychomotor performance with age are well documented but are quite variable. [14] Related to this, a recent survey performed within the Society of Surgical Chairs resulted in the recommendation that mandatory cognitive and psychomotor testing should be conducted in surgeons by at least age 65 years and that consideration should be given to making this testing a component of ongoing professional practice evaluation. [15] The present STS Workforce survey showed that 85.3% of CT surgeons worked in institutions which did not conduct performance testing. Of the 14.7% of surgeons that did, only 53.1% reported that testing was mandatory. It is anticipated that more institutions will offer voluntary and mandatory testing programs in the coming years.

The 2019 survey showed that the percentage of women in CT Surgery continues to grow. The current survey reported that 8.4% of respondents were female, up from 6.9% in 2014. Women In Thoracic Surgery, an organization founded in 1986, continues to show both an

expanding membership and an expanding array of scholarships, awards, and mentorship opportunities specifically for women in various stages of their CT surgery careers.[16]

The present survey showed that many surgeons have continued to expand their skill sets and incorporate ultra-specialized procedures into their practices in order to remain competitive, with 18.9% reporting that they learned a new surgical skill over the past year. These skills are often not provided during formal residency training, but attained through self-acquisition or through fellowships. This is supported by the findings of increased training time (9 or more years in 51.3%, up from 40.2% in the 2014 survey) as well an increase in educational debt in the current survey. In addition, 5% of surgeons replied that they obtained Masters of Business Administration (MBA) (5.8%), Master of Science (5.2%), or Doctor of Philosophy (PhD) (4.5%) degrees.

The STS National Database has become a critical tool for tracking outcomes and quality in thoracic surgery. A slight increase in participating programs (90.5%) was observed in the present survey compared with that conducted in 2009 (89.9%). In addition, 62.1% of responding cardiac surgeons reported that they use the STS risk calculator during the consideration of their surgical consultations. Most hospitals appreciate the importance of the data provided by the survey and have provided the financial and infrastructural support needed for database participation (71.8% in the present survey). The outcome results from databases such as the STS and the ACS National Surgical Quality Improvement Plan (NSQIP) are being increasing used to evaluate surgeon performance and accountability and are incorporated into the incentive structure of compensation plans. The present survey showed that 57.7% of surgeon respondents reported that their income had a bonus structure, and 64% of these respondents said that quality and outcomes were a component. In response to a new question used in this survey, 47.4% of surgeons reposted that they had become more “risk-averse” in the selection of patients for surgery as a result of this increasing scrutiny. While it is well established that close attention to quality and outcomes improves patient safety,[17] it can also be argued that excessive application of this practice could blunt surgeon enthusiasm for advancing the surgical field with new devices and techniques for fear of the potential backlash resulting from failure.[18, 19]

In addition to the increasing emphasis being placed on outcomes measures, surgeons are expected to be more clinically productive. In the current survey, 68.9% of surgeons whose income included a bonus structure were incentivized based upon number of work relative value units (wRVUs). In addition, 28.1 % of surgeons stated that they work in an institution which uses a funds flow financial model (which provides funds to Departments calculated by an assessment of value, usually the wRVU). Data regarding trends in wRVU output form CT surgeons is lacking. However, the data from this survey appear to support a slowly emerging paradox which has particular impact on those surgeons working in academic centers. The passage of the Affordable Care Act ushered in a new paradigm with regard to the relationship between physicians and payers emphasizing payment for quality and condemning payment for quantity, a stance quickly adopted by the Centers for Medicare and Medicaid Services. Despite this, administrators in academic institutions are moving toward employing the wRVU as the metric for productivity that largely defines the extent to which physicians are compensated. While this may still have relevance to some extent in the private

sector, physicians within academic medical centers have long challenged the appropriateness of the wRVU as a compensation metric, as it fails to consider increased patient complexity, teaching, research, and publications as well as commitments to national societies. Numerous reports have commented on how this current trend toward wRVU-based compensation, which offers little or no reward for academic productivity, is a proximate cause of the ongoing attrition of the surgeon scientist.[20,21]

Notwithstanding the current challenges discussed above and others facing cardiothoracic surgeons, career satisfaction has not waned. The present survey demonstrated that 83.1%% of practicing surgeons are satisfied or very/extremely satisfied with their careers, compared with 72.8% in the 2014 survey and 72.0% in the 2009 survey. This enthusiasm is reflected in the increasing percentage (50.3%) of practicing CT surgeons stating that they would recommend that their children or grandchildren pursue a career in CT surgery, compared with 47.5% in 2014 and 37.1% in 2009. However, despite this increasing level of satisfaction, 55.7% of surgeons reported symptoms of burnout and/or depression related to their jobs over the past year in the face of overall decreasing work hours compared with 2014. This survey did not track specific elements contributing to these symptoms such as emotional exhaustion, depersonalization and decreased sense of personal accomplishment. Nevertheless the crude percentage of surgeons endorsing the overall sense of burnout and/or depression is 10–20% higher than that observed in other specialties.[22] In the light of these findings, increased attention to the identification and mitigation of these symptoms in our workforce is mandated.

One significant limitation to the present survey is the low response rate from STS members (27.9% compared with 29.1% in 2014 and 47.5% in 2009). The reasons for this are not entirely clear but may reflect reluctance to commit the response time in the face of an increasing burden of various survey requests extended to surgeons. A recent American College of Surgeons workforce survey, polling over 3800 surgeons over 2 months, resulted in a 15% response rate.[23] Within the current survey, the reported statistical model predicted only a 2.5% data variance with 95% confidence, but it is possible that this low response rate has introduced some biases into the present survey results. New methods of obtaining this data with a more robust surgeon response are required. Nevertheless, cardiothoracic surgery remains vital to the US medical workforce, and the results of the current survey support a positive future for our specialty.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

References

1. Ikonomidis JS. The Society of Thoracic Surgeons Thoracic Surgery Practice and Access Task Force: 2014 Workforce Report. Ann Thorac Surg. 2016 12;102(6):2118–2125. [PubMed: 27637287]
2. Shemin RJ, Ikonomidis JS. Thoracic Surgery Workforce: report of STS/AATS Thoracic Surgery Practice and Access Task Force--Snapshot 2010. Ann Thorac Surg 2012;93:348–355. [PubMed: 22186470]
3. Brewer LA, Ferguson TB, Langston HT, Weiner JM. National thoracic surgery manpower study. Los Angeles, CA, Cunningham Press, 1974.

4. Adkins PC, Orthner HF. The Society of Thoracic Surgeons Manpower Survey for 1976: a summary. Ann Thorac Surg 1979;28:407–412.] [PubMed: 496494]
5. Feldstein PJ, Viets HP. Forecasting health manpower requirements: the case of thoracic surgeons. Ann Thorac Surg 1979;28:413–422. [PubMed: 496495]
6. Cleveland RJ, Orthner HF, Bahnson HT, Ferguson TB, Spencer FC, Bonchek LI, Kirsh MM, Loop FD. The third manpower study of thoracic surgery: 1980 report of the Ad Hoc Committee on Manpower of The American Association for Thoracic Surgery and The Society of Thoracic Surgeons. J Thorac Cardiovasc Surg 1982;84:921–932. [PubMed: 7144224]
7. Loop FD, Wilcox BR, Cunningham JN, et al. Thoracic surgery manpower. The fourth manpower study of thoracic surgery: 1985 report of the ad hoc committee on manpower of the American Association for Thoracic Surgery and The Society of Thoracic Surgeons. Ann Thorac Surg 1987;44:450–461. [PubMed: 3675049]
8. Cohn LH, Anderson RP, Loop FD, et al. Thoracic Surgery Workforce Report. The fourth report of the thoracic surgery workforce committee of the American Association for Thoracic Surgery and The Society of Thoracic Surgeons. J Thorac Cardiovasc Surg 1995;110:570–585. [PubMed: 7637387]
9. Shemin RJ, Dziuban SW, Kaiser LR, et al. Thoracic surgery workforce: snapshot at the end of the twentieth century and implications for the new millennium. Ann Thorac Surg 2002;73:2014–2032. [PubMed: 12078824]
10. Jacobs ML, Mavroudis C, Jacobs JP, Tchervenkov CI, Pelletier GJ. Report of the 2005 STS congenital heart surgery practice and manpower survey. Ann Thorac Surg 2006;82:1152–1159. [PubMed: 16928571]
11. Grover A, Gorman K, Dall T, Jonas R, Lytle B, Shemin R, Wood D, Kron I. Shortage of cardiothoracic surgeons is likely by 2020. Circulation 2009;120;488–494. [PubMed: 19635974]
12. Williams TE Jr, Sun B, Ross P Jr, Thomas AM. A formidable task: Population analysis predicts a deficit of 2000 cardiothoracic surgeons by 2030. J Thorac Cardiovasc Surg 2010;139:835–840. [PubMed: 20117796]
13. Moffatt-Bruce S, Crestanello J, Way DP, Williams TE Jr. Providing cardiothoracic services in 2035: Signs of trouble ahead. J Thorac Cardiovasc Surg 2018;155:824–829. [PubMed: 29221739]
14. Dellinger EP, Pellegrini CA, Gallagher TH. The aging physician and the medical profession: a review. JAMA Surg 2017;152:967–971. [PubMed: 28724142]
15. Rosengart TK, Doherty G, Higgins R, Kibbe MR, Mosenthal AC. Transition planning for the senior surgeon: guidance and recommendations from the Society of Surgical Chairs. JAMA Surg 2019;154:647–653. [PubMed: 31090889]
16. Antonoff MB, David EA, Donington JS, Colson YL, Litle VR, Lawton J, Burgess NL. Women in Thoracic Surgery: 30 Years of History. Ann Thorac Surg 2016;101:399–409. [PubMed: 26694290]
17. Coulson TG, Mullany DV, Reid CM, Bailey M, Pilcher D. Measuring the quality of perioperative care in cardiac surgery. Eur Heart J Qual Care Clin Outcomes 2017;3:11–19. [PubMed: 28927188]
18. Shahian DM, Jacobs JP, Badhwar V, D'Agostino RS, Bavaria JE, Prager RL. Risk aversion and public reporting. Part 1: observations from cardiac surgery and interventional cardiology. Ann Thorac Surg 2017;104:2093–2101 [PubMed: 29100643]
19. Shahian DM, Jacobs JP, Badhwar V, D'Agostino RS, Bavaria JE, Prager RL. Risk aversion and public reporting. Part 2: mitigation strategies. Ann Thorac Surg 2017;104:2102–2110. [PubMed: 29100640]
20. Keswani SG, Moles CM, Morowitz M, Zeh H, Kuo JS, Levine MH, Cheng LS, Hackam DJ, Ahuja N, Goldstein AM; Basic Science Committee of the Society of University Surgeons. The future of basic science in academic surgery: identifying barriers to success for surgeon-scientists. Ann Surg 2017;265:1053–1059. [PubMed: 27643928]
21. Ikonomidis JS, Menasché P, Kreisel D, Sellke FW, Wo YJ, Colson YL. Attrition of the cardiothoracic surgeon-scientist: definition of the problem and remedial strategies. J Thorac Cardiovasc Surg 2019;158:504–508. [PubMed: 31208802]
22. Dimou FM, Eckelbarger D, Riall TS. Surgeon burnout: a systematic review. J Am Coll Surg 2016;222:1230–1239. [PubMed: 27106639]

23. Mahoney ST, Strassle PD, Schroen AT, Agans RP, Turner PL, Meyer AA, Freischlag JA, Brownstein MR. Survey of the US surgeon workforce: practice characteristics, job satisfaction, and reasons for leaving surgery. J Am Coll Surg 2020;230:283–293. [PubMed: 31931143]

Table 1.

Years of post-MD training prior to entering practice.

Responses	2019 Survey		2014 Survey (N=1,061)	2009 Survey (N=1,758)	2005 Survey	2003 Survey
	N	%	%	%	%	%
2010 to 2014	7	0.7	--	--	--	--
2000 to 2009	180	18.3	7.9	0.3	0.0	0.0
1990 to 1999	311	31.6	32.1	23.6	14.0	5.0
1980 to 1989	317	32.2	33.8	39.2	36.0	34.0
1970 to 1979	143	14.5	20.5	27.0	32.0	30.0
1960 to 1969	25	2.5	5.3	8.1	14.0	19.0
1950 to 1959	1	0.1	0.4	1.3	3.0	12.0
Before 1950	7	0.7	--	0.4	1.0	0.0
Total	*984*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

Table 2.

Advanced professional degrees earned since obtaining an MD

Responses	2019 Survey		2014 Survey (N=1,063)	2009 Survey (N=1,762)	2005 Survey
	N	%	%	%	%
Doctor of Philosophy (PhD)	44	4.5	5.1	4.4	4.0
Juris Doctor (JD)	0	--	0.0	0.6	1.0
Masters of Business Administration (MBA)	57	5.8	4.7	3.5	4.0
Masters of Public Health (MPH)	31	3.1	2.0	0.9	1.0
MHA/MHSA	13	1.3	1.3		
MS (all)	51	5.2	3.0		
Other	22	2.2	1.3	5.9	
Total Respondents	*985*	*100.0*	*100.0*	--	

Table 3.

Total educational debt at the start of practice.

Responses	2019 Survey		2014 Survey (N=1,041)	2009 Survey (N=1,719)	2005 Survey	2003 Survey
	N	%	%	%	%	%
$0	317	32.4	34.9	33.7	38.9	35.8
$1-$20,000	129	13.2	12.9	14.7	16.6	19.2
$20,001-$40,000	104	10.6	10.5	12.2	10.8	12.7
$40,001-$60,000	85	8.7	7.7	9.5	9.3	9.4
$60,001-$100,000	70	7.2	13.4	13.9	24.4	22.8
More than $100,000	98	10.0	20.8	16.1		
Total	174	17.8	*100.0*	*100.0*	*100.0*	*100.0*
Mean Debt:	$72,541		$62,815	$56,688	$41,082	$39,316
Median Debt:	$32,074		$25,000	$25,000	$15,000	$20,000

Table 4.

Trends in number of operative procedures performed in the last twelve months.

Responses	2019 Survey		2014 Survey (N=1,025)	2009 Survey (N=1,614)	2005 Survey
	N	%		%	%
Decreased compared to the prior 12 months	226	23.7	26.0	30.4	39.3
Increased compared to the prior 12 months	350	36.7	42.6	24.8	21.3
Remained about the same compared to the prior 12 months	378	39.6	31.4	44.7	39.4
Total	*954*	*100.0*	*100.0*	*100.0*	*100.0*

Table 5.

Case mix distribution

Responses	2019 Survey		2014 Survey (N=1,002)	2009 Survey (N=1,672)	2005 Survey
	N	%	%	%	%
Adult Cardiac Surgery	615	65.6	69.1	70.0	80.0
Vascular Surgery	204	21.8	26.4		
Pulmonary Surgery	552	58.9	63.3	64.4	84.0
Esophageal Surgery	325	34.7	36.8	36.2	59.0
Congenital Heart Surgery in the Adult	178	19.0	23.6	22.2	62.0
Congenital Heart Surgery in the Infant and Child	96	10.2	11.2	10.9	11.0
Not applicable	--	--	--	0.7	--
Adult Cardiac Surgery	*Estimated number of annual cases:*	150.3	140.7	164.3	
Vascular Surgery		57.0	72.5	--	
Pulmonary Surgery		97.4	96.4	97.2	
Esophageal Surgery		29.5	29.4	23.3	
Congenital Heart Surgery in the Adult		10.2	15.1	17.9	
Congenital Heart Surgery in the Infant and Child		64.2	132.3	110.2	
Total Respondents	*937*	--	--	--	--

Table 6.

Performance of specific surgical procedures.

	2019 Survey (N=901)			2014 Survey (N=1,006)	2009 Survey (N=1,762)
Responses	Currently perform	Plan to perform	Do not perform	Yes	Yes
	%	%	%	%	%
Endobronchial ultrasound	17.8	2.9	79.4	14.5	
Endovascular aortic procedures	31.2	3	65.7	27.7	27.0
Endoscopic mucosal resection	2.6	1.9	95.5	2.5	
Endoscopic ultrasound	--	--	--	6.6	
Heart transplantation	17.2	2.8	80	17.3	
Implant cardiac assist devices	34.7	6.7	58.7	31.5	27.4
Lung transplant	9.6	1	89.3	9.7	
MAZE (any technique) for atrial fibrillation	67.6	0.8	31.7	67.0	63.5
Minimally invasive aortic valve repair	34.0	3.4	62.6	34.3	
Off-pump CABG	45.6	0.6	53.8	51.6	
Peripheral vascular surgery	23.9	0.3	75.8	26.7	32.7
Robotic mitral valve replacement/ repair	3.6	3.5	92.8	4.9	
Robotic lobectomy	21.9	6.5	71.7	10.6	
Right thoracotomy mitral valve replacement/repair	30.7	4.5	64.8	35.1	
Thorascopic esophagectomy	18.8	2.9	78.3	14.2	
Thorascopic lobectomy				37.8	
Tracheal surgery	35.0	1.6	63.5	32.9	
Transcatheter aortic valve replacement	43.7	5.2	51.1	23.8	
Transcatheter mitral valve procedures	20.3	10.3	69.4	20.3	
Transvalvular procedures	20.4	5.2	74.4	20.4	
Other	35.3	2.6	62.2	35.3	2.3

Table 7.

Surgeon income

Responses	2019		2014		Adult Cardiac Surgeon		General Thoracic Surgeon		Congenital Heart Surgeon	
	N	%	N	%	2019 (n=571)	2014 (n=688)	2019 (n=260)	2014 (n=224)	2019 (n=91)	2014 (n=84)
<$200,000	29	3.1%	45	4.5%	2.6%	4.8%	5.0%	4.9%	1.1%	1.2%
$200,000–399,999	117	12.7%	199	20.0%	11.2%	18.8%	17.7%	27.2%	7.7%	10.7%
$400,000–599,999	215	23.3%	330	33.1%	17.2%	32.8%	38.1%	39.7%	19.8%	17.9%
$600,000–799,999	234	25.4%	213	21.4%	27.9%	23.1%	20.8%	12.1%	23.1%	32.1%
≥$800,000	253	27.4%	133	13.4%	33.6%	13.1%	9.6%	7.1%	39.6%	32.1%
I would rather not disclose my income.	74	8.0%	76	7.6%	7.5%	7.4%	8.8%	8.9%	8.8%	6.0%
Total	*922*	*100%*	*996*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*

Table 8.

Career satisfaction

Responses	2019 Survey		2014 Survey (N=995)	2009 Survey (N=1,670)	2005 Survey	2003 Survey
	N	%	%	%	%	%
Extremely satisfied	161	16.8	14.9	17.5	15.0	12.0
Very satisfied	358	37.3	28.6	28.7	26.0	23.0
Satisfied	279	29.0	29.3	25.8	27.0	26.0
Somewhat satisfied	135	14.0	21.3	21.3	23.0	28.0
Not at all satisfied	28	2.9	5.9	6.8	9.0	11.0
Total	*961*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Mean Rating: *		3.5	3.3	3.3	3.1	3.0

* 5 = Extremely satisfied, 4 = Very satisfied, 3=Satisfied, 2 = Somewhat satisfied, 1 = Not at all satisfied