

Plenary presentations and public citations from The American Association for Thoracic Surgery

Mohamed Kamel, MD,^a Yusuke Terasaki, MD,^b Prasad S. Adusumilli, MD, FACS,^c and
Brendon M. Stiles, MD^a

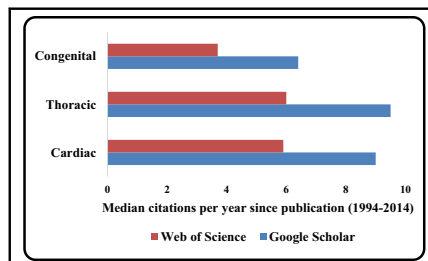
ABSTRACT

Objective: We examined the impact of work presented in the plenary sessions at the meeting of The American Association for Thoracic Surgery (AATS), by determining how frequently the published papers corresponding to the session presentations during the past 20 years, were cited; those that were most cited were identified.

Methods: We reviewed the AATS meeting programs from the 20-year period from 1994 to 2014 and identified the corresponding publications in the *Journal of Thoracic and Cardiovascular Surgery (JTCVS)* from all abstracts presented at the plenary sessions. Papers were categorized as cardiac, thoracic, or congenital. References were evaluated for subsequent citation in the Web of Science (WoS), and Google Scholar (GS). We determined both the median number of citations overall, and per year. For comparison, we evaluated numbers of citations in WoS from current *JTCVS* papers in issues containing the 3 most-cited plenary session papers.

Results: Among 195 published plenary papers, the median number of citations in WoS and GS was 49 and 76, respectively. The median total number of citations in WoS was as follows: 51 for cardiac-category papers (n = 105); 61 for thoracic (n = 55), and 41 for congenital (n = 35). These values were higher than the median total number of citations for contemporary nonplenary *JTCVS* papers: cardiac (22, n = 55; P < .001); thoracic (31.5, n = 8; P = .183); and congenital (15.5, n = 24; P = .002) papers published in *JTCVS*. The median number of citations per year since publication for plenary publications was 5.9 (cardiac), 6 (thoracic), and 3.7 (congenital), respectively.

Conclusions: Publications corresponding to the plenary sessions of the AATS are highly cited and include some of the seminal studies in our field in the past 20 years. (*J Thorac Cardiovasc Surg* 2016;151:30-4)



Median number of citations per year since publication.

Central Message

Publications from the plenary sessions of the AATS meeting are highly cited and include some of the seminal studies in the field of thoracic surgery.

Perspective

The plenary scientific session of the AATS meeting provides a forum for presentation and discussion of the most-significant clinical research in the field of cardiothoracic surgery. Publications corresponding to the presentations are highly cited and include some of the seminal studies in the field in the past 20 years.

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In his opening remarks at the inaugural meeting of The American Association for Thoracic Surgery (AATS), on June 10th, 1918, S.J. Meltzer, the first president, eloquently described to a group of general surgeons the reason for the society's creation: for the advancement of the knowledge of

and skill in thoracic surgery.¹ He emphasized the need to "single out" the thoracic cavity, and to focus on pathologies that occur above the diaphragm. Until that time, the chest had garnered little attention from most of the leading surgeons and experimental investigators.

Now, close to a century later, the field of thoracic surgery is robust, thanks to the tireless work of many pioneering surgeons and institutions. The field has branched out into the subspecialties of cardiac, general thoracic, and congenital surgery. Fueled by surgical and technologic advances, research in the field of thoracic surgery has grown exponentially. Each year, from among hundreds of abstracts, the AATS abstract committee selects those they believe to describe the most important and influential clinical research in each subspecialty, to be presented at the plenary scientific session. The aim of this study is to examine the impact of the work selected by the AATS for

From the ^aDepartment of Cardiothoracic Surgery and ^bDepartment of General Surgery, New York-Presbyterian Hospital/Weill Cornell Medical Center; and ^cThoracic Service, Memorial Sloan Kettering Cancer Center, New York, NY.

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M.K. and Y.T. contributed equally to this work.

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Address for reprints: Brendon M. Stiles, MD, 525 E 68th St, #Mb 110, New York, NY 10065 (E-mail: brs9035@med.cornell.edu).

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Abbreviations and Acronyms
 AATS = The American Association for Thoracic Surgery
 GS = Google Scholar
JTCVS = *The Journal of Thoracic and Cardiovascular Surgery*
 WoS = Web of Science citation index

this session, by determining how frequently the published papers from the session were cited. We sought to identify and capture the historical significance of the most-cited publications of the past 20 years within the fields of cardiac, general thoracic, and congenital surgery.

METHODS

We reviewed the AATS annual meeting programs from 1994 to 2014, using the AATS Web site to identify presentations from the Monday and Tuesday morning plenary sessions. The corresponding publications in *The Journal of Thoracic and Cardiovascular Surgery (JTCVS)* were identified using a PubMed search for a similar title with the same principal investigator, published within 2 years of the presentation. Papers were classified as cardiac, general thoracic, or congenital; the country and institution where the principal investigation took place were noted. Studies that were conducted across institutions were categorized as multi-institutional, and those conducted across institutions in different countries, international.

Our search of the identified papers was conducted in August 2015 using 2 databases; the Web of Science citation index (WoS; formerly ISI Web of Knowledge), and Google Scholar (GS). Web of Science includes data from 23,000 scientific journals from the year 1900 to the present. The WoS Web site is maintained by Thomson Reuters, which assigns a yearly impact factor to scientific journals. Google Scholar covers a wider array of scientific literature, including books and abstracts, and pre-prints and online reports not found in WoS.

For each discipline, the publications were arranged in descending order by number of citations determined by the WoS. A citation density (the number of times a work was cited per year since publication) was calculated for each publication. The median number of citations overall, and per year, was then calculated for each discipline. For comparison, we evaluated citation numbers in WoS from contemporary *JTCVS* papers published in issues containing the 3 most-cited plenary session papers in each subspecialty.

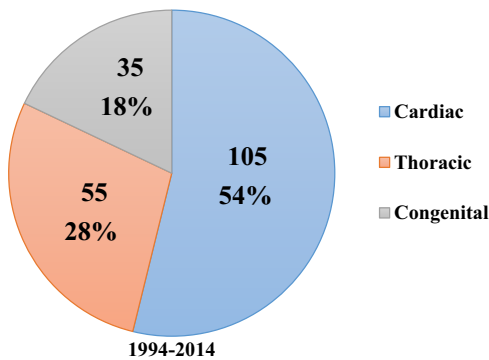


FIGURE 1. Numbers and percentages of AATS plenary papers (1994-2014), by subspecialty.

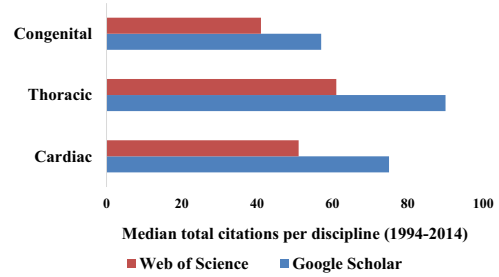


FIGURE 2. Median total citations of AATS plenary papers, per subspecialty.

RESULTS

Total Citations and Citations per Year

In the study period, 220 papers were presented at the Monday and Tuesday plenary sessions. Of these, 195 (89%) were subsequently published in *JTCVS*, including 105 in the cardiac category, 55 in general thoracic, and 35 in congenital. Six were published in other journals (Figure 1). The median number of citations for the 3 disciplines combined was 49 in WoS, and 76 in GS. We divided the papers by subspecialty to determine, for each database, their total number of citations, and number of citations per year, since publication (Figures 2 and 3).

For papers in the cardiac category, the median total number of citations was 51 in WoS, and 75 in GS; the median number of citations per year was 5.9. For the general thoracic category, the median total number of citations was 61 in WoS, and 90 in GS; the median number of citations per year was 6. For the congenital category, the median total number of citations was 41 in WoS, and 57 in GS; the median number of citations per year was 3.7.

For comparison, we evaluated total number of citations in WoS per year, from all of the papers published in *JTCVS* in the same issues as the 3 most-cited papers from each subspecialty: 55 cardiac, 24 congenital, and 8 general thoracic. The median total number of citations from *JTCVS* plenary session papers was significantly higher than the median total number of citations for contemporary nonplenary papers in each category: cardiac (22, n = 55; $P < .001$); thoracic (31.5, n = 8; $P = .183$); and congenital (15.5, n = 24; $P = .002$) (Figure 4).

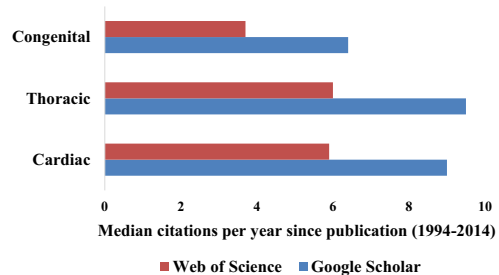


FIGURE 3. Median citations of AATS plenary papers, per year since publication.

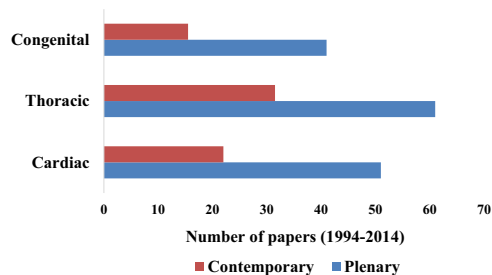


FIGURE 4. Numbers of AATS plenary papers, compared with contemporary papers.

Most-Cited Papers in Each Subspecialty

We chose to focus on citation number in WoS for the remainder of the study, to determine the most-cited papers in each subspecialty. Among papers in the cardiac category, the 5 most cited include papers on bilateral internal mammary grafting, off-pump coronary bypass, endovascular grafts for thoracic aortic aneurysms, management of ischemic mitral regurgitation, and valve preservation in ascending aorta repair (Table 1). Among papers in the thoracic category, the topics of the 5 most cited include lung metastasectomy, pleural mesothelioma, postintubation tracheal stenosis, primary lung tumors, and methods of postesophagectomy cervical anastomosis (Table 2). For papers in the congenital category, the most cited include papers on hemodilution and hypothermic cardiopulmonary bypass, arterial switch operation for transposition of the great arteries, brain maturation in patients with congenital heart defects, predictors of outcome after the Fontan procedure, and repair of congenital heart defects in low-weight newborns (Table 3).

Of the 94 papers published from 2005 to date, 9 (9.6%) were labeled as highly cited papers by WoS (highly cited was defined as being in the top 1% of cited papers in the field for papers published in the past 10 years, along with papers from the past 2 years that received a very high number of citations in the current 2-month period). Of these, 5 papers were in the thoracic category, and 4 in the cardiac category.

Country of Origin and Institutions

An examination of the number of plenary papers, based on country of origin, showed that most came from the

United States, followed by Canada. More than 50 institutions were represented, spanning 11 countries. The institution with the most papers was the University of Toronto, at 12; Washington University and Cleveland Clinic were next, with 10 each (Table 4).

DISCUSSION

Since the inception of the AATS in 1918, the field of thoracic surgery has grown and evolved to an extent that S.J. Meltzer and his colleagues would never have imagined almost a century ago. In the same opening statement in which he described the outlook for the field of thoracic surgery, he listed some of the seminal work being conducted at the time: management of empyema by entering the pleural cavity, the concept of “intratracheal intubation” during surgery, and the rather controversial use of thoracotomy to manage pulmonary tuberculosis.¹ Conspicuously absent from this list were any operations performed on the heart, as it would take another 3 decades before the likes of C. Walton Lillehei and F. John Lewis would perform the first open surgery on the heart.

The founders of the AATS surely would never have imagined that over the next century, the overwhelming majority of plenary research would be focused on the heart. The increased interest in cardiac surgery within the field is reflected by the number of citations within the top 5 papers: The total number of citation of the top paper in cardiac surgery is one and one half times that for the top paper in thoracic surgery. Although the focus on pathologies within thoracic surgery may have shifted, the same effort to investigate the most-controversial concepts in thoracic surgery can be seen in the plenary papers chosen by the AATS today. Novel approaches to performing procedures, technologic advances, new discoveries on perioperative care of cardiothoracic patients, and management of surgical complications are some of the overriding themes of the most-cited papers in our analysis.

Within adult cardiac surgery, and of all the papers we analyzed in our study, the most frequently cited was by Lytle and colleagues.² They retrospectively compared outcomes for patients undergoing elective surgery for coronary artery bypass grafts who received either single or bilateral internal thoracic artery (ITA) grafts. Although

TABLE 1. Most-cited cardiac papers

Year	Institution	First author and reference number	Subject of the paper	Citations (WoS)
1999	Cleveland Clinic	Lytle ²	Bilateral internal mammary grafting	474
2003	Emory University	Puskas ³	Off-pump coronary bypass	335
1998	Stanford University	Dake ⁴	First-generation endovascular grafts for descending thoracic aorta	318
2001	Cleveland Clinic	Gillinov ⁵	Repair vs replacement of ischemic mitral valve	305
1998	National Heart and Lung Institute, London	Yacoub ⁶	Valve preservation in ascending aorta repair	276

WoS, Web of Science citation index.

TABLE 2. Most-cited thoracic papers

Year	Institution	First author and reference number	Subject of the paper	Citations (WoS)
1997	Multi-institutional	Pastorino ⁷	Long-term results of lung metastasectomy	346
2008	Multi-institutional	Flores ⁸	Pneumonectomy vs pleurectomy for malignant pleural mesothelioma	198
1995	Massachusetts General Hospital, Boston, Mass	Grillo ⁹	Postintubation tracheal stenosis	196
2008	Multi-institutional	Boffa ¹⁰	Surgical management of primary lung tumors	195
2000	University of Michigan, Ann Arbor, Mich	Orringer ¹¹	Methods of cervical anastomosis	172

WoS, Web of Science citation index.

controversy remains about increased levels of wound infections in diabetic patients, this paper is significant in that it revealed that use of bilateral ITA grafting decreased the risks of death, reoperation, and percutaneous transluminal coronary angioplasties, compared with use of single ITA grafting. The topics discussed in the remaining papers that have the most citations are equally controversial, including off-pump coronary artery bypass grafting, and use of stent grafts for patients with descending thoracic aortic aneurysms.

The most-cited article in the field of thoracic surgery is the paper by Pastorino and colleagues,⁷ who highlighted the potentially curative value of lung metastasectomy of various malignancies. Finally, within the field of congenital cardiac surgery, the article by Jonas and colleagues¹² had the most citations. They reported on a randomized controlled study that suggests the possibility of adverse neurologic and developmental outcomes for pediatric patients who undergo cardiac surgery with cardiopulmonary bypass using hemodilution protocols. Their article had almost twice as many citations as the second-most highly cited publication within the field of congenital surgery, owing to its broad-reaching contribution to the entire field of cardiac surgery. Their study was not only the first randomized controlled study within the congenital field, but also the first to look at hemodilution during cardiopulmonary bypass in adults and children.

Plenary session papers at the AATS meeting represent the most-relevant and highest-quality research presented at the annual meetings. Therefore, the current paper may be used as a concise resource of highly influential articles within the field of thoracic surgery, in its subcategories of adult cardiac, thoracic, and congenital cardiac surgery. The

determination of the 5 most-cited papers within each field is corroborated by the use of 2 search engines, each catering specifically to members of the scientific community. Although we chose to use WoS to determine the top 5 rankings within each field, the same 5 papers would have been identified had we used GS instead.

Our study does have limitations. Unlike some bibliometric studies that have analyzed the most-cited papers within an entire field, we chose to focus on plenary presentations presented *only* at the AATS meeting and published *only* in *JTCVS*. As a result, other influential papers that were published in other journals are not captured in our study.

In addition, our study looked at papers published during the last 20 years only. An analysis of papers published during the entire course of AATS history (since 1918) may have allowed us to better visualize trends, for example, within each subspecialty per decade. O'Sullivan and colleagues¹⁷ did such an analysis of the 100 most-cited papers in the field of cardiac surgery; Ahmad and colleagues¹⁸ did the same in their analysis of the 100 most-cited papers in the field of bariatric surgery.

In creating our table of the 5 most-cited papers within each subspecialty, we ranked each paper according to the absolute number of citations, instead of citation per year, thereby introducing bias toward older papers. This trend is mirrored in our findings—most of the papers were published more than a decade ago. An example of this bias is the exclusion of landmark papers, such as the study by Kirklin and colleagues¹⁹ of mechanical circulatory devices as an alternative to heart transplantation, which would have been in the top 5 had we used citations per year since publication.

TABLE 3. Most-cited congenital papers

Year	Institution	First author and reference number	Subject of the paper	Citations (WoS)
2003	Boston Children's Hospital, Boston, Mass	Jonas ¹²	Hemodilution and hypothermic cardiopulmonary bypass	177
1995	Boston's Children Hospital, Boston, Mass	Wernovsky ¹³	Outcomes of the arterial switch operation for transposition of the great arteries	166
2009	Children's Hospital of Philadelphia, Philadelphia, Pa	Licht ¹⁴	Brain maturation in patients with congenital heart defects	118
2002	Children's Hospital of Philadelphia, Philadelphia, Pa	Gaynor ¹⁵	Predictors of outcome following the Fontan procedure	83
2001	Northwestern University, Chicago, Ill	Mavroudis ¹⁶	Cavopulmonary conversion for Fontan operation failures	82

WoS, Web of Science citation index.

TABLE 4. Top-ranking institutions

Institution	Number of papers
University of Toronto, Toronto, Canada	12
Cleveland Clinic, Cleveland, Ohio	10
Washington University, St Louis, Mo	10
Massachusetts General Hospital, Boston, Mass	6
University of Pittsburgh, Pittsburgh, Pa	6
Mayo Clinic, Rochester, Minn	6
University of Michigan, Ann Arbor, Mich	5
NewYork-Presbyterian Hospital (The University Hospital of Columbia and Cornell), New York, NY	5
Boston Children's Hospital, Boston, Mass	5

CONCLUSIONS

Over the past century, since the introduction of thoracic surgery, the field has flourished and diversified thanks to developments in surgical techniques, technologic advancements, and understanding of disease processes. Our intent in conducting this study was to highlight some of the most influential research presented at the AATS meeting and subsequently published in *JTCVS* during the past 20 years, in recognition of the approaching 100th anniversary of the Society. By looking back at the progress and contributions the AATS has made in the field of thoracic surgery, the authors hope that this review will stimulate further advances and serve as a guide for current and future surgical trainees.

Conflict of Interest Statement

Authors have nothing to disclose with regard to commercial support.

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Key Words: AATS, plenary sessions, citation

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