

Beyond borders—international database collaboration in thoracic surgery

John Agzarian, Yaron Shargall

Division of Thoracic Surgery, Department of Surgery, Faculty of Health Sciences, McMaster University, St. Joseph's Healthcare Hamilton, Hamilton, ON L8N 4A6, Canada

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Correspondence to: Yaron Shargall, MD FRCSC. Division of Thoracic Surgery, Department of Surgery, Faculty of Health Sciences, McMaster University, St. Joseph's Healthcare Hamilton, T2105-50 Charlton Ave East, Hamilton, ON L8N 4A6, Canada. Email: shargal@mcmaster.ca.

Abstract: Thoracic surgery databases continue to emerge as pillars for institutional quality improvement and research endeavors. This paper reviews the current state of the largest thoracic surgery databases: the Thoracic Surgeons General Thoracic Surgery Database (STS-GTSD) and the European Society of Thoracic Surgery Database (ESTSD). In addition, we utilize these as a platform to evaluate the role and key ingredients for successful international database collaborations. Ultimately, collaborative efforts among large databases unify research efforts, foster cohesion, serve as benchmarks for quality improvement locally, nationally and internationally, promote comparative innovation, and ultimately improve patient outcomes.

Keywords: Thoracic surgery database; international collaborations; quality improvement

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Introduction

Over the past two decades there has been strong impetus towards quality improvement via audit and feedback methodology. Large centralized databases have served as a platform bridging practice gaps between different institutions and serving as a comparator. The principle motivation of large databases is twofold: firstly, centralized data gathering allows for program evaluation and quality improvement; and secondly, large cohorts of data from multiple centers/surgeons provide a rich opportunity for collaboration and research.

Recently, emerging focus is being placed on international database collaborations (1), with the goal of unifying practice patterns and improving international thoracic surgery quality. Such an endeavor however does not come without inherent challenges. This review article summarizes the current state of databases in Thoracic Surgery, and provides a synopsis of the movement towards international,

multi-continent collaboration, as well as its benefits and expected challenges. In addition, to highlighting the benefits and importance of collaboration, we also emphasize core principles that are essential to proper execution of such a substantial task.

Current state

To date, there are two large multicenter thoracic surgery databases comprising the bulk of Thoracic database research and quality improvement projects. In just under 2 decades, the quality and impact of each of these databases has substantially improved, and they have both been the subject of widespread notoriety and application within the field of thoracic surgery. They currently serve as the basis for future development of thoracic surgery international database collaboration.

The Society of Thoracic Surgeons General Thoracic Surgery Database (STS-GTSD) is the world's largest

clinical general thoracic database (2). It was established in 2002 as a derivative of the previously created STS national cardiac surgery database in 1989. Functioning as a voluntary database, the STS-GTSD provides semiannual performance reports to participants in order to allow for comparative analysis and improvements. Participation by surgeons and/or institutions continues to rise steadily, with most recently reported metrics depicting contribution from 961 surgeons among 348 hospitals in the United States for a total of 505,440 operations (3). Despite the large number of contributors, there are only 8 surgeon participants outside of North America (1,3). Data is entered at a local level and captures 100% of the operations performed at the participating institution (4). Oversight of the GTSD is maintained by the GTSD Task Force, with data being reviewed and updated every 3 years—in order to accommodate emerging trends and practice changes. The objection of the GTSD is providing feedback on quality assessment data in order to serve as a foundation for clinical practice improvements efforts (5). Secondly the database also serves as a valuable resource and template for clinical research in patient outcomes and practice assessment. Such efforts have guided the creation of risk adjustment model of lung and esophageal surgery (6-13).

The European Society of Thoracic Surgery Database (ESTSD) was initially conceived in 2001 as a joint ESTS project in conjunction with the European Association for Cardio-thoracic Surgery (EACTS). Between 2003 and 2007, data input was halted after which an updated version for the registry was being released (14). Participation is voluntary and free, with data input being performed with the aid of an online platform. The most recent version of the database comprises 5 modules covering the breadth of thoracic surgical practice in Europe: lung, thymus, mesothelioma, neuroendocrine tumors and chest wall. Since the launch of the updated registry there has been a continued increased in participation, with 170 European centers active contributors and a total of 10,000 to 15,000 new cases being collected annually (1). Similar to the STS-GTSD, the ESTSD mostly comprises of European centers, with only 15 non-European contributors among the 24 total countries participating in the registry. Given the larger variability and diversity among the continent (in comparison to North America), the central objective of the ESTSD is the evaluation and standardization of surgical outcomes and procedures across Europe. This served as the impetus behind the creation of the multi-parametric Composite Performance Score (CPS) comprised of risk-adjusted outcomes and process indicators,

to compare individual center performance, which is used as an important determinant of qualification by the European Institutional Accreditation Program (15,16). While voluntary, countries such as France have adopted the ESTSD as part of a mandatory accreditation process for all thoracic surgery centers, whereas in other countries the participation is limited to only one or few surgeons/centers per country. Our center has recently joined the ESTSD, together with two additional Chinese centers. We are now in a process of expanding this collaboration to other centers in Canada and China (17).

Trans-Atlantic collaboration

With the establishment of each database and a solid foundation in place, recent efforts have focused on unifying thoracic surgery across the Atlantic. The obvious benefit of such work is the ability to standardize thoracic surgery care at a larger scale so that a patient (regardless of location or access) can have comparable care with similar outcomes. In addition, this creates fertile ground for collaboration, large-scale quality improvement and clinical outcomes research. Moreover, international database collaboration has a spill-over effect in the areas of education and surgical training, with a possible (though challenging) end goal of unified training across the world, as well as shared technical experience and operative exposure.

For cross-database collaboration to take place, comparison of the GTSD and ESTSD is required, identifying unique commonalities and challenges. Several publications provide direct clinically-focused comparators. In 2016, Ceder *et al.* published a comparative analysis of variation in pulmonary resection practices utilizing data from the GTSD and the ESTSD between 2010 and 2013. Among 78,212 lung resection (GTSD, n=47,539; ESTSD, n=30,673), STS patients were more likely to be female with mediastinal negative disease, previous cardiothoracic operations, and greater likelihood of neo-adjuvant radiotherapy. Thirty-day mortality was greater in the GTSD compared to the ESTSD for wedge resection, but lower for lobectomies and pneumonectomies. Finally, length of stay was shorter in the GTSD groups, despite an increased risk of reintubation, atrial arrhythmias and returns to the operating room (18). This study highlights some of the inherent challenges of international database collaboration. The authors highlight the obvious inter-societal and regional variations among both database cohorts, and provide comparative analysis as a bridge

towards standardization and practice-sharing.

While such comparative analysis is important, it may be confounded by intrinsic factors of each database variables that are part infrastructure of each database that lead to differences in data input, analysis and comparison. Mitigating these differences and overcoming these challenges has been the focus of international database collaboration between the STS and ESTS. In addressing these obstacles, it is important to consider several key factors in order to improve and facilitate collaborative efforts. Attention to the following elements not only decreases differences between the GTSD and ESTSD, but also serves an opportunity to harmonize both databases going into the future. In addition, this serves as a template for the inclusion of other databases and international societies in future collaborative efforts. The following sections address important factors to consider in the ongoing effort to database collaboration.

Nomenclature

For comparison and collaboration to occur, one first must compare “apples to apples”. Beyond all else, this has proven to be the greatest challenge to database fusion and comparative analysis. In 2012, a working group composed of members from the GTSD and ESTSD met to create a set of common variables between the two databases with standardized definitions to be adopted in upcoming revisions and iterations of the databases (14). The panel was able to identify 50 common variables and create standardized definitions. In addition, variables that were not present in both databases were added with common agreed upon definitions. This work ultimately led to the comparative analysis previously mentioned by Ceder *et al.*

Differences in definitions and variables stem from variability in healthcare systems and patient population. For example, length of stay and readmissions to hospital post-discharge after thoracic surgery might substantially differ between centers, countries and databases simply due to significant differences between various healthcare systems, and not necessarily due to differences in the quality of surgery or peri-post operative care provided to the patients. As such, those parameters might not be a reliable parameter to use for quality comparison purposes. Nonetheless, evaluating the metrics of both the GTSD and the ESTSD has identified more commonalities, and provided outlook on ways to decrease differences. Nomenclature harmonization requires analysis and evaluation of all

fields throughout a patients’ treatment pathway. The working group was able to identify differences throughout the fields of data entry, including clinical presentation, diagnosis, surgical procedures and post-operative events. Many of the differences can be remedied with matching and redistribution, but one must first know the intrinsic differences in order to tackle them.

Auditing

Voluntary clinical databases such as the GTSD and the ESTSD provide a distinct advantage to administrative data (collected by government or local/private agencies mainly for the purpose of administrative and program assessments). While the latter provides the advantage of decreased cost and ease of data gathering in a centralized/unified way, the information provided is often less granular with less information acquired (19-21). In a 2015 comparative analysis of the sampling techniques of GTSD and the NSQIP administrative database, Allen *et al.*, reported glaring differences between the two databases in terms of data capturing (100% in the GTSD *vs.* 19.3% in the NSQIP) and post-operative event reporting (30.1% *vs.* 17.2% in the GTSD and NSQIP databases, respectively). Reported event rates in post-operative complications differed between both databases within the same institution, questions the accuracy and reproducibility of the entire data. The authors concluded that partial sampling (inherit of administrative databases) provides incomplete foundation for quality improvement and procedure-specific analysis (4). The importance of this study is in highlighting differences among databases, based on the data acquisition and the extent of the metrics being evaluated. While neither the GTSD nor the ESTSD are administrative databases, differences between both do exist and therefore the possibility for non-reproducibility and non-comparability (while small) still exists.

The benefit of administrative databases over voluntary clinical databases is perhaps in the consistency of data acquisition and reporting. Although the data may not reflect the breadth and specific detail within an institution, the acquired data is well and consistently gathered, usually with data input being preceded by training. The GTSD and ESTSD rely on independent data input by local institutions—another potential source for variability; hence, the importance of auditing. The main purpose of auditing a voluntary clinical database is independent external validation. In 2010, an external annual audit was

initiated by the GTSD. By 2015, 10% of participating programs were randomly selected for audit, with 20 cases (lobectomies and esophagostomies) being randomly audited at each institution. This most recent audit demonstrated accuracy as measured within 4 categories of like variables and overall ranged from 96.3% to 99.25%. Disagreement between general data and audited sites usually reflected differences in data collection processes and interpretation. The audit information was fed back to audited institutions in a summary report (22).

Although the entire process of audit and feedback is resource intensive and demanding, several benefits make this an integral part of a thoracic surgery database. Firstly, auditing decreases heterogeneity and improves consistency among contributing members. Secondly, feedback has the benefit of promoting quality improvement interventions at the institutional level to improve patient care, but also improve future participation to the database. Thirdly, audit provides a research opportunity for generalized feedback to the database in general, potentially allowing for the evaluation of the effects of auditing on maintenance and quality of a designated database. Fourthly and likely most importantly, audits performed across (and not only within) databases serve as an excellent means of mitigating differences between databases to facilitate collaboration. If the same external audits are performed on different databases, this has the obvious benefit of improving internal validity, but a downstream effect could be the enhancement of external validity and harmonization between different databases.

Research & funding

In addition to quality improvement, the evolution of thoracic surgery databases has led to their heightened utility for research purposes. The obvious advantage of databases as research tools is the ability to evaluate outcomes using large data sets that would otherwise be logistically near impossible to gather at individual centers. Database research promotes standardization of definitions, enhances collaboration, and assures maintenance of high quality data. Moreover, it also serves as an opportunity for funding that can funnel back to maintenance and improvement of database initiatives. Joint research opportunities are perhaps the main impetus promoting cross-database collaboration. The ability to connect research efforts from different continents not only increases sample size, but also allows for heightened external validity, as practices and patients

become more generalizable at a global level.

In 2017, the STS published an update on research activities related to the GTSD. The report highlights two research programs with dedicated task forces: (I) the access and publications program (STS funded), and (II) the Longitudinal Follow-Up and Linked Registries Task Force (externally-funded) (21). These efforts have essentially centralized research endeavors produced using GTSD data. In addition, the STS has allowed creation of a research program enabling access to de-identified patient-level database data that can be used at individual institutions for research purposes. This program, labeled the STS PUF task force (STS Participant User File program) evaluates the application of different research proposals using the GTSD, provides feedback as to the sustainability and quality of the research, and facilitates pertinent and appropriate data retrieval (23). This creates a unified process with transparency, with the added goal of promoting collaboration and involvement at the GTSD by different institutions. GTSD endorsed research initiatives are also presumably more likely to be funded by governmental agencies.

Ultimately, as databases continue to emerge as a mainstay of thoracic surgery research, the quality of the data and its maintenance will similarly continue to improve. Moreover, this research push (beyond simple quality improvement projects) is a strong motivator for unification of databases and collaboration among different database committees. The obvious benefit of databases is the ability to address research questions with large datasets that would otherwise be nearly impossible to gather locally at the institutional level. The quality of the research hinges on the quality of the data, and as such, research and quality improvement seem to be the ultimate motivators towards improved sustainability of database and collaboration so as to increase the datasets even more and improve the generalizability of the research projects they produce.

Joint database guidelines

As trans-Atlantic collaboration continues to evolve, merging of databases will ultimately become a necessary reality. In this natural progression one finds the value of joint committees/taskforces, as well as joint guideline publications. As the major Thoracic Societies continue to collaborate and develop expert committees, local practice patterns are expected to become more similar. In turn, the data and its meaningfulness also become more homogenous and comparable. This ultimately has the end goal of

producing common information among different databases and countries with heightened possibilities for collaboration.

For example, the ESTS, the STS, the General Thoracic Surgery Club and the American Association for Thoracic Surgery (AATS) assembled a joint panel of experts to review the data and make recommendations regarding the management of the pleural space. This collaboration evidence-based consensus document was published in the *European Journal of Cardio-Thoracic Surgery* in 2011 (24). A more recent publication in the *Annals of Thoracic Surgery* evaluation variation in pulmonary resection practices between STS and ESTS databases. The study concluded that there exist differences in patient population, procedure performed and outcomes—serving as impetus for standardization of practices and quality improvement (18). Finally, our institution is spearheading a joint AATS and ESTS taskforces evaluation the management of venous thromboembolic (VTE) prophylaxis following Thoracic Surgery. The committee, which currently includes members from North America, Europe and Asia, will hopefully soon release published evidence-based recommendations to guide practice and treatment decisions (25). As more joint international processes continue to develop, the motivation for collaboration among databases will continue to strengthen. Joint guidelines will ultimately allow for similar data to be presented, and will then lead to ease of comparison among databases and improved validity. In Canada, there is currently no central database mechanism in thoracic surgery, though several academic divisions have already joined forces in sharing a common platform for prospectively collected database. In May 2018, the Canadian Association for Thoracic Surgeons (CATS) will host its inaugural National Database meeting. It is hoped that following that meeting, a national platform will evolve and most, if not all, centers will participate. Further collaboration between CATS and the ESTS (and STS) is a natural evolution. It is the authors' hope that such a collaboration will develop and mature quickly, as some Canadian thoracic surgery centers are already enrolled within those two major databases.

Leadership & vision

Undoubtedly, the aforementioned factors are of trivial value without the presence of vision, planning and leadership. Collaboration at an international scale is certainly no small feat. For database collaboration to continue to flourish, the need for deterministic leadership and direction is

obvious. There is certainly great purpose and motivation for international joint collaboration among the executive branches of several societies. It is important to foster that sense of purpose with unified vision and clear guidance. Additionally, as there is an increase push towards healthcare transparency, at least in the USA (26-28), it is expected that thoracic surgeons in North America and beyond will soon need to report their outcomes to the public. This development further highlights the need for a uniform, tight, high-quality collecting and reporting mechanism, based on high-quality databases, which will be led by thoracic surgeons rather than by governmental agencies. Thus, leadership and direction (which are already in motion), are becoming extremely timely and important for the international thoracic surgery community.

Conclusions

Thoracic surgery Databases continue to evolve over the last decade. Beyond quality improvement, they serve a major research purpose- being able to answer questions at a large scale across various institutions of different expertise and capacities. It important to note that database research has its limitations, with quality of the research projects hinging on quality of the data collected. As databases continue to be better maintained, it is important to harness their utility by promoting collaboration at the international level. Data sharing increases collegiality and transparency, and most importantly leads to improvement patient outcomes at the individual surgeon and institutional level. This article highlights several key factors to consider regarding collaboration of databases among different societies in Thoracic Surgery. As more societies emerge throughout the globe, we hope this serves as a template for collaborative efforts, establishing its importance and the means of success.

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Footnote

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