American Association for Thoracic Surgery Quality Gateway (AQG): Interim report

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The essence of running a high-quality cardiothoracic program, a measure of excellence, is an immediately available, current, reliable, and matrix of data outcomes that all participants trust. Today, most such interested participants (quality officers, department chairs, or individual surgeons) rely on data such as mortality or wound infection that is updated weekly or monthly and trended on a graph over time. However, the data may not be that current and is not matched to an external data set or risk adjusted.

The American Association for Thoracic Surgery (AATS) is poised to launch the AATS Quality Gateway (AQG) to address gaps in quality assurance with cutting-edge tools for benchmarking and improving the quality of your cardiothoracic surgery program. The initial launch of AQG will focus on adult cardiac procedures. The thoracic surgical program will focus on oncology and launch later in 2024.

Conceived and led by the enthusiastic endeavors of Past President David Adams, MD, supported by AATS members Eugene Blackstone, MD, and Julie Swain, MD, assisted by a consulting team lead by David Booth, PhD, and the biostatistical expertise of expert machine-learning developer Hemant Ishwaran, PhD, AATS has developed AQG to address gaps in timely monitoring of cardiothoracic surgery quality. It will be the “Gateway” for novel, comprehensive risk assessment.

Initially, a variable dictionary was created, then a database of 55,000 cases was compiled from participating institutions. Thereafter, Eugene Blackstone, MD, and Hemant Ishwaran, PhD, used advanced machine learning and high-performance computing to train and generate an algorithm, the Blackstone–Ishwaran algorithm. This was used for risk-adjusted outcomes prediction for mortality, stroke, deep sternal wound infection, prolonged intubation, reoperation, prolonged length of stay, composite morbidity, and others. The algorithm encompasses all adult cardiac surgical procedures, including all isolated and even complex combinations of surgical components other than cardiac transplantation and implantation of durable assist devices. Training the algorithm is continuous and immediate such that theoretically it can be updated with every new case added to the database. Currently, 21 variables are incorporated in the algorithm, with some 20 additional candidate variables that, with a larger database, may move in or out of the existing algorithm to refine prediction accuracy.

Risk assessment is unlike any seen before. For example, any comparisons of your program with any aggregate will be only to the set of cases identical to yours using universal virtual twin technology, one of several tools for the AQG that have been developed with support from the National Institutes of Health.

The AQG offers participants 3 important new methods of looking at data that will assist you in making decisions about the quality of your program. First, as soon as a case is uploaded, the data are visible and are also part of the aggregate data. A participant surgeon can then pull up, for example, outcomes for coronary artery bypass surgery, such as death, stroke, wound infection, prolonged intubation, reoperation, readmissions, et cetera, and see trend lines for those events. This allows for real-time assessment of whether the occurrence of wound infection increases by a surgeon or group and facilitates investigation of the cause. Second, because the AATS algorithm is inclusive of 19 cardiac procedure components and all combinations thereof, the
surgeon can share with a prospective patient the predicted mortality or stroke for that specific procedure. Third, with risk-adjusted data available to participants, they can with confidence see how they compare with like patients (virtual twins) in outcomes. This may allow institutions who are either left-side or right-side outliers on the binomial distribution curves to either advise or ask for help for those who are not meeting standardized quality metrics, for the good of all patients we serve.

There are some points about the AQG that need to be stressed. It has been years in the making by a dedicated team of AATS members, AATS administration, potential sites, consultants, and statisticians. Credit is due to them for their perseverance and endurance—Rome was not rebuilt in a day after the calamitous July 18 fire of 64 CE. The abstracting of data from electronic medical records is an ongoing objective to ease the center burden but one that we are committed to achieving. Currently, structured operative reports can be built in Epic that then can be sources for uploading the data to the Gateway. AATS continues to work with partners to use natural language processing to access data for uploading. The Blackstone–Ishwaran algorithm requires a defined small number of variables known preoperatively, including derived variables. Up to 259 data points are sourced potentially for a case, although, for example, 106 are needed for an isolated coronary artery bypass operation. Test runs have shown that such a case entry into current databases takes 70 minutes for 272 elements, whereas for the AQG it takes 30 minutes for 96 elements, an improvement in efficiency and cost reduction in data entry. At launch, AQG will support simple upload of flat-file data (such as CSV files), which will also reduce data abstraction time while improving the quality of inputted data. A modern registry for our specialty must move away from manual data entry whenever possible.

The AQG effort is not a clinical procedure research database. The vision is that, over time, like-minded institutions may choose to put together advanced-quality and research modules on a procedure, such as mitral valve repair and long-term outcomes. The combination of a modern algorithm and high-quality, lower-cost data abstraction will build a fertile substrate for artificial intelligence–driven research, where patient data can be mined for heretofore-unrecognized relationships. AATS is leading the way for cardiothoracic surgeons to transition from only investigator-initiated hypothesis development to investigate hypotheses developed via machine learning. Our patients and our specialty deserve a technology that embraces the promise of artificial intelligence to improve the quality of patient care.

To learn more about the AATS Quality Gateway, please access the AATS website (https://www.aats.org/) or review upcoming marketing materials and exhibits.

Conflict of Interest Statement
The authors reported no conflicts of interest.

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