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Commentary: The end of one journey is the beginning of the next

Nicolas Zhou, DO, and Mara B. Antonoff, MD

Data function as the new oil in the digital world. Health care may be one of the last industries to fully digitize, but we have long used data as part of the scientific method to make decisions for our patients. Now that we are consistently collecting data on all of our patients and analyzing them on a population level, do we have the ability to answer all clinical questions with the power of large databases?

In this issue of the *Journal*, Kurlansky¹ expertly tells the tale of 2 databases. Developed out of the necessities to evaluate quality and cost of care, clinical and administrative databases are used to generate data analytics for risk models in cardiac surgery, as well as to evaluate reimbursement decisions as the cost of health care continues to expand.

Administrative databases excel in modeling cost but are inadequate for assessing performance across patient risks, whereas clinical databases focus on patient outcomes. Numerous publications have resulted from such databases to guide our treatment algorithms. However, even the most robust clinical databases cannot capture every possible variable that may potentially lead to differences in outcomes across time periods. The limitations of these databases, as well as the logistics of maintaining an ever-expanding list of variables, lead to problems of scale and lack of information detailed enough for nuanced analyses. Although efforts to bridge the gap have been made by combining both types of databases,¹ there is still much to be desired with the current infrastructure, considering the incoming sources of Big Data that are high volume, high velocity, and high variety. Data science and use of advanced data analytics are sorely needed to provide

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CENTRAL MESSAGE

Clinical and administrative databases in cardiothoracic surgery each have strengths and limitations; their complementary roles highlight the need for data science and advanced data analytics.

the necessary infrastructure to generate the type of research needed to address specific questions and for us to practice precision medicine.

Trained data scientists not only work to maintain Big Data; they also develop artificial intelligence (AI) tools to perform tedious tasks that would take thousands of hours of manual chart review to perform. In our own experience, we have worked collaboratively with data scientists to extract data across multiple data silos, as well as use natural language processing to build patient cohorts of interest.^{2,3} These are just the beginning steps of using an arsenal of AI tools to address research questions that would have been prohibitively labor intensive. In the future, the use of other tools such as optical character recognition,² convolutional neural networks,⁴ and many other forms of AI may serve to improve clinical and administrative data in accuracy, detail, and completeness.

Lastly, health care data are no longer isolated to hospital systems alone. Technology companies have advanced into the health care space, and they are collecting data on patients that neither clinical nor administrative databases could achieve—continuously, automatically, and in the comfort of patients' homes. The Apple Heart Study garnered much attention for its feasibility of using a wearable device in detecting atrial fibrillation in a transient general population.⁵ This study recruited more than 400,000 patients in a matter of 8 months. The speed and scale of this study was a sneak peek into a new territory of

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collaborative research with health care and technology companies. Cardiothoracic surgeons should take notice of the rapid development of noninvasive devices and their potential to change practice patterns. We urge our readers to have a basic understanding of data science and to be ready to adopt new technology into our patient care.

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Commentary: A statistical revolution: Channeling frustration to integration

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Banks were initially created for individuals to receive loans, make deposits to keep their monies safe, and create savings accounts that earn interest. As societies developed and modernized, the system developed multifaceted functions of financing, bankruptcies, investments, credit cards, currency exchanges, and so on. Now, imagine this complex banking system if someone had to connect 2 separate structures to see all of his or her debt in 1 place and all of his or her financial assets in another. What if, to see your information, it would take an application and require 6 to 12 months of review, after which you may be informed that a request error was found and you have to start the process over again. Painful right?

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CENTRAL MESSAGE

Administrative and clinical databases serve a crucial function in cardiothoracic surgery, but it would be best practice to evolve and integrate the 2 to provide seamless access to correct data.

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Kurlansky¹ summarized the growing pains and differences between administrative and clinical data sources. Both are crucial to understanding patient care within cardiothoracic surgery, serve as foundational pieces in quality improvement, and are accessed by different stakeholders in patient care. When organizations rely on these data sources separately, it creates significant burdens to combine the 2, causing limitations in available data and the speed at which it can be obtained. In part, the motivation for the American Association for Thoracic Surgery Quality Assessment Program was immediacy of data.^{2,3} Integration is emerging but controlled by big data warehouses that