More than just numbers: Counting thoracic aortic disease just isn't that simple

Derrick Y. Tam, MD, and Stephen E. Fremes, MD, MSc

From the Division of Cardiac Surgery, Schulich Heart Centre, Department of Surgery, Sunnybrook Health Sciences Centre, University of Toronto, Toronto, Ontario, Canada.

Disclosures: Authors have nothing to disclose with regard to commercial support.

Received for publication Dec 4, 2017; accepted for publication Dec 14, 2017; available ahead of print Jan 10, 2018.

Address for reprints: Stephen E. Fremes, MD, MSc, Dr Bernard S. Goldman Chair in Cardiovascular Surgery, Schulich Heart Centre, Sunnybrook Health Sciences Centre, 2075 Bayview Ave, Room H4 05, Toronto, Ontario M4N 3M5, Canada (E-mail: Stephen.fremes@sunnybrook.ca).

J Thorac Cardiovasc Surg 2018;155:2265-6

0022-5223/\$36.00

Copyright © 2018 by The American Association for Thoracic Surgery

<https://doi.org/10.1016/j.jtcvs.2017.12.058>

In this issue of the *Journal*, McClure and colleagues¹ tackle a seemingly simple yet difficult question in cardiac surgery—what is the incidence of aortic dissection and what factors are associated with mortality in this high-risk population? The authors addressed this question using health system administrative databases housed at the Institute for Clinical and Evaluative Sciences. McClure and colleagues¹ estimated the incidence of aortic dissection/rupture and thoracic aortic aneurysm to be 4.6 per 100,000 and 7.6 per 100,000, respectively, in Ontario, Canada. They used International Classification of Disease, 10th edition (ICD-10) codes that were cross-validated with Canadian Classification of Health Intervention codes and Ontario Health Insurance Plan physician billing codes. Both in-hospital mortality and late 3-year all-cause mortality were ascertained through linkages with Ontario's mortality register. Operative mortality for type A aortic dissection was 21% during the time frame of the study—hospital survival of patients with type A aortic dissection increased, presumably as more patients who presented with dissections underwent surgery (Table 4). More than 80% of open surgical procedures were performed by cardiac surgeons, whereas the majority (>90%) of endovascular cases were performed by vascular surgeons. In-hospital mortality for dissection or aneurysms was worse in women than men, and the 3-year outcomes were worse for the aneurysm cohort in women.

Nonetheless, these findings must be interpreted in the context of some important limitations that are intrinsic to administrative database studies. The success of any study using administrative data depends on identifying the correct patients using a limited set of codes. Here, the authors used ICD-10 along with Canadian Classification of Health Intervention and billing codes to identify aneurysms and dissections, a disease that is often misdiagnosed. It is important to note that these codes were not validated through an external chart review to determine the accuracy of the codes for the disease in question. Furthermore, a study flow diagram was not provided to illustrate how

Drs Stephen E. Fremes, MD, MSc and Derrick Y. Tam, MD

Central Message

The incidence of aortic dissection and thoracic aneurysms has increased significantly from 2002 to 2014 in this Ontario population-based observational study.

See Article page 2254.

many patients were excluded in the generation of this cohort. Although the actual incidence of aortic dissection may be accurate, as one would expect that the great majority of these patients present to hospital, the prevalence of aneurysms is likely underestimated, as outpatients seen in clinics were not included in this analysis.²

For patients undergoing surgery, the authors were able to identify the type of procedure and associated segment of the aorta that required intervention. However, for patients who were medically managed, the ICD-10 codes do not distinguish between type A and type B dissections (I71.0 – “dissection of aorta [any part]”). Instead, the authors used an algorithm to separate type A and B dissections by assuming those with a diagnosis of dissection, not undergoing surgery, and surviving to discharge were all medically managed type B dissections. This assumption may lead to misclassification; those with type A dissections treated medically who survived to discharge would be classified as type B. Although medical treatment of a type A dissection is uncommon for acute dissection,³ this may be appropriate for chronic type A dissection. It is also unclear how other thoracic aortic emergencies such as penetrating ulcer or intramural hematoma are represented. Only 1.5% of patients with thoracic aneurysms and 1% of the overall patients in this study were identified as having a connective tissue disorder, whereas the Yale Center of Aortic Diseases found that syndromic and nonsyndromic genetic disorders accounted

for up to 21% of dissections.⁴ An interesting finding by McClure and colleagues¹ was the increase in the incidence of aortic dissection. It is unclear whether this is a true increase or due to a greater awareness on the part of emergency physicians and/or greater access to thoracic imaging.

The implications for the health care system are very different for dissections compared with unruptured aneurysms, as the former typically require immediate assessment. In Ontario, cardiac surgical care is regionalized to 11 centers that perform cardiac surgery. Geographically, Ontario is expansive and covers more than 900,000 square kilometers of land, with a population density of 14 persons/km². Although the majority of the population live in a Census Metropolitan Area, where most cardiac surgical centers are concentrated, for approximately 11% of Ontarians living in rural areas or the wilderness, access to a cardiac surgical center is not readily available. Patients who present with acute aortic syndromes to centers without cardiac surgical expertise are emergently referred to the nearest center through a centralized referral system called CritiCall. The cardiac surgeon then reviews the imaging using an online centralized system.

Despite the coordination, in-hospital mortality was substantially greater for patients requiring transfer for surgical management compared with those diagnosed at a cardiac surgical center (45.5% vs 62.5%; $P < .001$). The relationship between surgeon volume and outcome has recently been demonstrated in the surgical management of type A aortic dissection; mortality was greater in surgeons who performed fewer than 4 cases compared with surgeons who performed more than 4 cases (19.3% vs 12.6%; $P = .015$).⁵ Given the multitudes of specialties involved in the care of these patients, some experts have advocated that the care of patients with thoracic aortic disease be managed at specialized centers to improve care coordination.³ We view expedient transfer and streamlining processes in the admitting hospitals to facilitate getting the patients to the operating room as soon as possible as the priority for the treatment of type A aortic dissections rather than further centralized care. Only 53% of patients with type A dissection underwent surgery; although this is in line with studies from Iceland⁶ and the United Kingdom,²

it suggests that there exists an opportunity to further improve the early management of such patients.

Improvements in cardiac care have traditionally relied on a thorough and detailed understanding of cardiac disease epidemiology; the research teams at Institute for Clinical and Evaluative Sciences have been at the forefront of leveraging administrative data to provide this knowledge.⁷ The contribution by McClure and colleagues¹ addresses fundamental and important measurements in thoracic aortic disease incidence and highlight several opportunities to optimize and enhance the health care system in the management of this precarious and rapidly fatal disease. In the era of big data, counting aortic dissections and aneurysms remains a complicated and difficult task. Other databases, such as the Society of Thoracic Surgeons National Database, may offer more clarity on the precise details of the surgical management of this disease, although reliance on administrative databases is probably still required to inform us about the incidence. The first step in solving a problem is recognizing that there is one—we congratulate McClure and colleagues¹ for taking on this challenge.

References

1. McClure RS, Brogly SB, Lajkosz K, Payne D, Hall SF, Johnson AP. Epidemiology and management of thoracic aortic dissections and thoracic aortic aneurysms in Ontario, Canada: a population-based study. *J Thorac Cardiovasc Surg*. 2018; 155:2254-64.
2. Howard DPJ, Banerjee A, Fairhead JF, Perkins J, Silver LE, Rothwell PM, Oxford Vascular Study. Population-based study of incidence and outcome of acute aortic dissection and premorbid risk factor control: 10-year results from the Oxford Vascular Study. *Circulation*. 2013;127:2031-7.
3. Bradley TJ, Bowdin SC. Multidisciplinary aortopathy clinics should now be the standard of care in Canada. *Can J Cardiol*. 2016;32:8-12.
4. Albornoz G, Coady MA, Roberts M, Davies RR, Tranquilli M, Rizzo JA, et al. Familial thoracic aortic aneurysms and dissections—incidence, modes of inheritance, and phenotypic patterns. *Ann Thorac Surg*. 2006;82:1400-5.
5. Bashir M, Harky A, Fok M, Shaw M, Hickey GL, Grant SW, et al. Acute type A aortic dissection in the United Kingdom: surgeon volume—outcome relation. *J Thorac Cardiovasc Surg*. 2017;154:398-406.e1.
6. Melvinsdottir IH, Lund SH, Agnarsson BA, Sigvaldason K, Gudbjartsson T, Geirsson A. The incidence and mortality of acute thoracic aortic dissection: results from a whole nation study. *Eur J Cardiothorac Surg*. 2016;50:1111-7.
7. Tu JV, Chu A, Donovan LR, Ko DT, Booth GL, Tu K, et al. The Cardiovascular Health in Ambulatory Care Research Team (CANHEART): using big data to measure and improve cardiovascular health and healthcare services. *Circ Cardiovasc Qual Outcomes*. 2015;8:204-12.