

Shopping for vascular surgery

Jack L. Cronenwett, MD, Lebanon, NH

In December the shopping malls are crowded. Many customers travel long distances in search of the right gift, the largest selection, or the best value. They are informed consumers, having checked product information and price comparisons in newspapers, in catalogs, and on the Internet. Those who live in rural areas may drive several hours and even stay overnight to optimize their holiday shopping weekend. These people like to patronize their local shops, but sometimes quality merchandise is unavailable. How does this apply to vascular surgery?

In this issue of the *Journal*, Drs Tu, Austin, and Johnston report the outcome of elective abdominal aortic aneurysm (AAA) surgery in Ontario, from 1992-1996.¹ Using appropriate multivariate techniques, the authors found that surgeon specialty and annual surgeon volume significantly influenced the 30-day mortality rate after elective AAA repair. Specifically, general surgeons had a risk-adjusted mortality rate 62% higher than certified vascular surgeons. Similarly, low-volume surgeons (< 5 elective AAA repairs per year) had a 30-day mortality rate that was 83% higher than high-volume surgeons (> 13 cases per year). These two variables were closely related, but were independently predictive of outcome.

It is interesting to compare the results of this population-based study from Ontario with similar data from the United States, as published recently in the *Dartmouth Atlas of Vascular Health Care*.² In the *Dartmouth Atlas* 25,000 nonmanaged care Medicare beneficiaries who underwent elective AAA repair in 1996 were analyzed and also stratified by surgeon volume and specialty status. A much larger percentage of elective AAA repairs was performed by Board-certified vascular surgeons in Ontario compared with the United States. In Ontario, 75% of elective AAA repairs were performed by vascular surgeons, 20% by general surgeons, and 5% by cardiac surgeons. In the United States, only 39% of elective AAA repairs were performed by Board-certified vascular surgeons, whereas 33% were performed by cardiac surgeons and 28% by general surgeons. When the operations were analyzed among

308 distinct geographic hospital referral regions in the United States, however, there was a large variation in the specialty type of surgeon who performed the most elective AAA repairs. For example, the percentage performed by vascular surgeons varied from 0% in nine regions to 92% in Greensboro, NC. The percentage performed by general surgeons varied from 0% in seven regions to 85% in Green Bay, Wis. In both Ontario and the United States, the annual volume of elective AAA repair was higher for vascular surgeons than for general or cardiac surgeons. In Ontario, vascular surgeons performed an average of 15 elective AAA repairs per year, general surgeons 5 per year and cardiac surgeons 4 per year. In the United States, vascular surgeons performed an average of 7.4 procedures per year, cardiac surgeons 3.9 per year, and general surgeons 2.9 per year. These estimates are artificially low for US surgeons because they do not include non-Medicare patients or managed care Medicare beneficiaries, but they do allow a relative comparison between specialty types. Thus, certified vascular surgeons performed an average of 3.0 and 2.6 times more elective AAA repairs per year than general surgeons in Ontario and the United States, respectively.

Outcomes reported after elective AAA repair in the *Dartmouth Atlas* are not strictly comparable to the Ontario report, because they were adjusted for age, sex, and race, but not for comorbidity. However, in the Ontario study, the impact of comorbidity adjustment, though statistically significant, was minimal (overall 30-day mortality rate: 4.2% unadjusted, 4.1% adjusted). Furthermore, the *Atlas* data included only Medicare patients from 1996, whereas the Ontario study included all patients, from 1992-1996. Nonetheless, a comparison of these outcomes is informative. In the United States, in 1996, the 30-day mortality rate after elective AAA repair in Medicare patients was 5.5%.² This varied significantly as a function of annual surgeon volume (Figure). Among surgeons who performed at least 11 elective AAA repairs, the 30-day mortality rate was 4.0%, but this increased to 7.9% among low-volume surgeons (≤ 3 operations per year). Of note, 60% of all surgeons who performed elective AAA repair were low-volume surgeons, and they provided care for 24% of patients undergoing elective AAA repair in the United States in 1996. Thus, low-volume surgeons had 83% and 98% higher mortality rates than high-volume surgeons after elective AAA repair in Ontario and the United States, respectively. This relationship between higher operative volume and lower mortality rates after elective AAA repair has previously been reported by others for both hospitals and individual surgeons.³⁻⁶

From the Section of Vascular Surgery, Dartmouth-Hitchcock Medical Center.

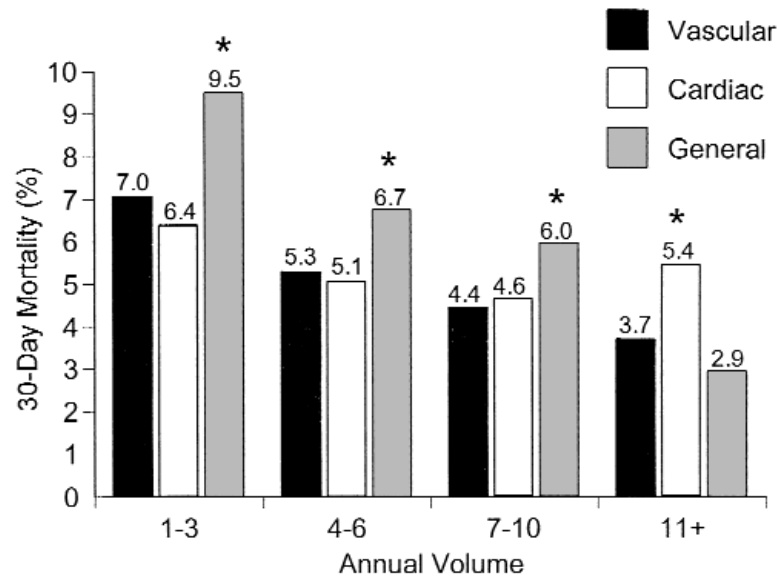
J Vasc Surg 2001;33:654-6.

Reprint requests: Jack L. Cronenwett, MD, Section of Vascular Surgery, Dartmouth-Hitchcock Medical Center, 1 Medical Center Drive, Lebanon, NH 03755 (e-mail: j.cronenwett@hitchcock.org).

Copyright © 2001 by The Society for Vascular Surgery and The American Association for Vascular Surgery.

0741-5214/2001/\$35.00 + 0 24/9/113488

doi:10.1067/mva.2001.113488



Thirty-day operative mortality rate after elective AAA repair in Medicare patients in the United States in 1996, as a function of surgeon volume and specialty. Annual volume does not include non-Medicare patients or Medicare managed care patients. Vascular surgeons were defined by Board-certification status. (* $P < .01$, χ^2 analysis; based on *Dartmouth Atlas of Vascular Health Care*).²

In addition to the important influence of surgeon volume on outcome, the Ontario study showed that surgeon specialty had an independent effect. Risk-adjusted 30-day mortality rates were 3.5% for vascular surgeons, 4.0% for cardiac surgeons, and 6.2% for general surgeons, the latter being statistically significant. Similar results were reported in the *Dartmouth Atlas*, where 30-day mortality rates were 4.4% for vascular surgeons, 5.4% for cardiac surgeons, and 7.3% for general surgeons. In the United States, much of this difference between specialty types was accounted for by differences in annual volume. However, when adjusted for volume (Figure), general surgeons had significantly higher mortality rates than vascular surgeons, except among the highest volume surgeons, where general surgeons had results comparable to vascular surgeons. In 1996 there were only 55 “highest-volume” general surgeons, compared with 1840 low-volume general surgeons. Pearce et al⁶ also found that vascular surgery certification was an independent predictor of better outcome after nonruptured AAA repair in Florida, where vascular surgeons had a 24% lower risk of adverse outcome.

It is intuitive that increased training and experience should improve the outcome of complex vascular surgery. This intuition has now been verified in studies from Ontario, Florida, and the entire United States.^{1,2,6} How should this influence the care of patients with AAAs? Tu et al¹ point out that patients undergoing elective AAA repair could be selectively referred to high-volume surgeons with vascular specialty training. Why does this not occur more frequently? Why do 24% of patients in the United States have their elective AAA performed by low-volume surgeons, and only 39% have their operation performed by a

certified vascular surgeon? Two arguments against regionalization are frequently cited. First, it is argued that low-volume surgeons must maintain their operative skills with elective AAA repair so that they can treat ruptured AAAs. However, rapid transport to regional centers is now available in nearly all areas, which is likely more successful than occasional repair in small hospitals, given the poor prognosis, in general. Second, it is pointed out that patients (and their primary physicians!) like to patronize local hospitals and avoid the inconvenience of travel to a distant referral center. However, AAA repair by low-volume surgeons does not occur simply in rural areas where there are no certified vascular surgeons. For example, in 1996, the percentage of elective AAA repairs performed by low-volume surgeons (≤ 3 per year) was 39% in Chicago, 58% in Portland, and 71% in Denver,² hardly areas where long-distance travel is a hardship or where certified vascular surgeons are unavailable. Rather, it is highly probable that this practice is determined by traditional referral patterns or managed-care referral guidelines, without attention to outcome.

Consider the argument that patients do not like to travel long distances to undergo vascular surgery by high-volume, certified surgeons. This simply does not pass the “shopping” test. Does it make sense that patients would drive farther to do their holiday shopping than to have their elective AAA repair? Not likely, unless they are uninformed, which is the key to this problem. In 2001, patients undergoing elective AAA repair are generally better informed about the relative value of regional shopping malls than they are about the relative outcomes in regional hospitals. Unfortunately, organized medicine has largely resisted the publication of hospital or surgeon outcomes, making it difficult for patients

to become informed consumers of health care. This resistance is often couched behind the inadequacy of illness severity adjustment and its possible impact on outcome reporting. Under this theory, outcome reporting is avoided completely, the unfortunate state that exists today.

Although the Ontario study in this issue of the *Journal* and the *Dartmouth Atlas of Vascular Health Care* has shown that surgeon volume and specialty type influence operative mortality rates, the most important message from these publications is that outcomes differ substantially after elective AAA repair. In many cases, where a patient lives may substantially influence the likelihood of survival after elective AAA repair. In 1996, if Medicare patients in the United States had been referred to surgeons who performed at least four elective AAAs per year, nearly 200 operative deaths could have been avoided. It is time for vascular surgeons to monitor and report their outcomes. Certainly our patients deserve better information for their vascular surgery shopping.

REFERENCES

1. Tu J, Austin P, Johnston K. The influence of surgical specialty training on the outcomes of elective abdominal aortic aneurysm surgery. *J Vasc Surg* 2001;33:447-52.
2. Cronenwett J, Birkmeyer J, editors. The Dartmouth atlas of vascular health care. Chicago: AHA Press; 2000.
3. Dardik A, Lin JW, Gordon TA, Williams GM, Perler BA. Results of elective abdominal aortic aneurysm repair in the 1990s: a population-based analysis of 2335 cases. *J Vasc Surg* 1999;30:985-95.
4. Kazmers A, Jacobs L, Perkins A, Lindenauer SM, Bates E. Abdominal aortic aneurysm repair in Veterans Affairs medical centers. *J Vasc Surg* 1996;23:191-200.
5. Manheim LM, Sohn MW, Feinglass J, Ujiki M, Parker MA, Pearce WH. Hospital vascular surgery volume and procedure mortality rates in California, 1982-1994. *J Vasc Surg* 1998;28:45-56; discussion: 56-8.
6. Pearce WH, Parker MA, Feinglass J, Ujiki M, Manheim LM. The importance of surgeon volume and training in outcomes for vascular surgical procedures. *J Vasc Surg* 1999;9:768-76; discussion: 777-8.

Submitted Dec 4, 2000; accepted Dec 4, 2000.

Please see related article by Tu et al on pages 447-52.

CORRECTION

In the paper titled "Incidentally detected stenoses proximal to grafts originating below the common femoral artery: Do they affect graft patency or warrant repair in asymptomatic patients?" published in the December 2000 issue of the *Journal of Vascular Surgery*, the word *infrageniculate* was incorrectly used throughout the article. The correct word should have been *infrainguinal*. A corrected version of the paper is on the Web site.

Gerald S. Treiman, MD