matters most; rather, each patient should be triaged to a medical center appropriately suited for the case complexity. The corollary to this point, then, is that the benefit of referring a patient to a high-volume center is in fact access to the highest-volume surgeons. As such, future studies addressing this relationship should perhaps consider shifting the focus from centers that have reached 10,000 cases to those with high proportions of surgeons who have achieved 10,000 hours.

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Commentary: The more, the better?

Tohru Asai, MD, PhD

In this issue of the *Journal*, Shang and colleagues¹ present their study of the relationship between volume and risk-adjusted mortality rates (RAMRs) using publicly available reports between 2005 and 2016 published by the New York State Department of Health. The reports are released annually, consisting of 3-year aggregates of mortality data for coronary artery bypass grafting (CABG) and valve surgery. These contain data from all 36 hospitals performing cardiac surgery except federal hospitals. RAMR data reported by the New York State Department of Health take account of variables, including age, gender, hemodynamic status, comorbidity, and prior cardiac surgery. The authors separated isolated CABG volume and valve cases including concomitant CABG and compared outcomes in the top and bottom volume quartiles.

Volume-outcome relation analysis is a matter of long-standing interest. In New York State, the New York Cardiac Surgery Reporting System has been gathering such data

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Tohru Asai, MD, PhD

CENTRAL MESSAGE

The relationship between case volume and RAMRs has been a matter of interest, but will the data trigger any improvement in the quality of cardiac surgery?

since 1989. The study by Hannan and colleagues² demonstrated a significant inverse relationship between CABG case volume and RAMR for both surgeons and hospitals. Those results have been used to justify the Leapfrog Group's 450-procedure standard for CABG. However, there were different interpretations for threshold case volumes. Since then, this topic has been debated continuously.

This presented study demonstrates several outcomes. First, total CABG volume decreased significantly while total valve procedure volume increased slightly. Second, valve surgery volume has concentrated to high-volume centers. Third, top-volume quartile centers have improved RAMR for both valve surgery and CABG. Fourth, there was a weak trend that the high-volume centers had better

RAMR with valve surgery than the low-volume centers, but such was not the case with CABG procedures.

These findings reflect some features of cardiac surgery in New York State. However, the quality of cardiac surgery is hard to measure. RAMR is just one aspect. Other important indices include rates of major complications, readmission, and long-term survival, for which not enough is publicly reported. For practicing cardiac surgeons, still other details are of interest. These include use of internal thoracic arteries in CABG, rates of off-pump approach in CABG, rates of conversion to on-pump, and rates in degenerative mitral valve repair.³ These seem important for quality improvement in cardiac surgical procedures, but there seem to be no publicly reported data and no impact on marketing and current reimbursement healthcare policy.

Relevant realistic questions include the following. Will these volume-outcome relation data trigger any improvement in the quality of cardiac surgery, and if so, how?

Will some surgeons and hospitals simply defer the high-risk patients? Will healthcare policymakers limit numbers of cardiac surgery centers? Most important, what will be the benefits for patients undergoing cardiac surgery? One may expect opinions and arguments on these issues to abound. But I sincerely thank Shang and colleagues¹ for drawing the attention of our readers to the cardiac surgery status in New York State and reality of the volume-outcome relationship for all those involved.

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Commentary: Does only the practice make the master?

Mateo Marin-Cuartas, MD, PhD,^{a,b} and Victor Dayan, MD, PhD^c

Mateo Marin-Cuartas, MD, PhD, and Victor Dayan, MD, PhD

In this issue of the *Journal*, Shang and colleagues¹ analyze the impact of procedural volume and market share (ie, volume concentration) on 30-day mortality after cardiac surgery. Publicly available data related to the outcomes after coronary artery bypass grafting (CABG) and/or valve surgery performed between 2005 and 2016 in hospitals in

CENTRAL MESSAGE

The influence of patient volume on surgical outcomes has been evidenced in this paper. This precedent should be considered for future policy changes regarding patient safety and outcome improvement.

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New York State are reported and analyzed. The main finding of this study is that valve surgery volume keeps increasing in high-volume centers, thereby continuously widening the outcome gap between high-volume and low-volume cardiac surgery centers.

The authors' findings are well in line with the current guidelines for the management of valve disease.² Although