

Cardiac Surgery: All for One and One for All

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Cardiac surgery is truly a team effort, dependent for its success on the knowledge, skills, and behaviors of a team of health professionals, supporting staff, and community caregivers.¹ Hitherto, attention has typically focused on the performance of the cardiac surgeon with little consideration of the contribution to outcomes of other members of the team, notably the anesthesiologist.²

In this edition of the journal, Glance et al.³ report on a retrospective study of 7920 patients undergoing coronary artery bypass graft in which the rate of death or major complications varied markedly across anesthesiologists. Analyses were controlled for patient demographics, severity of coronary artery disease, comorbidities, and hospital quality. It was assumed that assignment to surgeon was random. The rate of death or serious complications in patients managed by low-performing anesthesiologists (3.33%; 95% confidence interval, 3.09–3.58) was nearly double the rate in patients managed by high-performing anesthesiologists (1.82%; 95% confidence interval, 1.58%–2.10%). Results were similar for all patient risk groups.

In this editorial, we consider 3 questions: How reliable is this observation? If this observation is true, what is the reason? If this observation is true, what should be done about it?

HOW RELIABLE IS THIS OBSERVATION?

This study has many strengths. The large patient cohort, derived from a population of approximately 20 million in New York state, underwent surgery during a short time span, so changes over time in the practice or performance of individual anesthesiologists were minimized. The analyses were adjusted for factors outside the control of anesthesiologists that may have affected the outcome, such as patient health status, and the observed effect was large, clinically relevant, and consistent with previous findings.^{4,5}

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This study also has limitations, many of which were enumerated by Glance et al.³ in their article. Three limitations concern us. First, data on the training, qualifications, and years of experience of the anesthesiologists are not collected in the New York State Cardiac Reporting System and therefore were not included in the analyses. We think these factors matter in cardiac anesthesiology.⁶

Second, the volume of practice of the included anesthesiologists was not considered. Anesthesiologists who managed <50 cases during the study period were excluded because of concerns about the precision of adjusted outcomes for low-volume providers. This amounted to 66% of the anesthesiologists and 33% of the cases. However, anesthesiologists managing widely varying numbers of patients remained in the cohort and their volumes of practice could have been factored in. It is known that volume of practice matters for cardiac surgeons, so why not cardiac anesthesiologists?²

Third, Glance et al. assumed that assignment of anesthesiologists to cases was random with respect to surgeon. They justified this on the grounds that they needed to choose between hospital and surgeon as a fixed effect in their model and by their impressions of actual practice in New York state. We find it surprising that pairing of anesthesiologists with surgeons would be completely random. In other health care systems, such as ours, factors such as personal choice and the complex requirements of scheduling influence the rostering of anesthesiologists and surgeons. An analysis that adjusted for the effects of both hospital and surgeon on anesthesiologist outcomes would have been ideal.

Notwithstanding these limitations, these are the most compelling data to date about the influence of the anesthesiologist on patient outcomes in cardiac surgery. Although replication in further studies is essential, these results justify an examination of the factors that might contribute to good and bad performance in cardiac anesthesiology.

IF THIS OBSERVATION IS TRUE, WHAT IS THE REASON?

Modern cardiac anesthesiology calls for technical knowledge and skill in preoperative assessment, the conduct of anesthesia, complex monitoring including echocardiography, cardiopulmonary bypass, and postoperative care. In addition, nontechnical or behavioral skills including vigilance, conscientiousness, decisiveness in complex uncertain situations, and excellence in communication are important.⁷ These skills are acquired and maintained through training, continuing professional development, and experience in practice. Of course, an equivalent set of technical and nontechnical skills are required for excellence

in cardiac surgery. In the United States and similar countries, the training and board certification of cardiac surgeons are very rigorous. In contrast, although many cardiac anesthesiologists have undertaken fellowship training in cardiac anesthesiology and echocardiography, this is not necessarily mandatory and there is no mandatory certification to ensure that a certain standard has been reached. Furthermore, cardiac surgeons typically pursue cardiac surgery full time, whereas cardiac anesthesiologists vary in the proportion of their working time devoted to cardiac anesthesiology, and for many this proportion is a day a week or less. These factors are likely to impact on the performance of cardiac anesthesiologists and translate into poor outcomes for patients. Unfortunately, analyses by Glance et al. do not illuminate the relationship between volume of practice, performance, and outcomes for cardiac anesthesiologists.

Low-performing anesthesiologists in this study were most likely weak in >1 area of knowledge, skill, or behavior. Using the analogy of Reason's Swiss cheese model,^{8,9} the low-performing anesthesiologists most likely had more holes (or latent factors) in each of their cheese slices (or defenses). Each hole might manifest as a relatively minor deficiency, perhaps in vigilance or in communication, but the collective contribution of these multiple minor failures likely impacted negatively on their patients' outcomes.¹⁰⁻¹² A recent review by Wahr et al.¹³ summarized the evidence supporting the importance of failures in communication and teamwork in the cardiac surgery enterprise, but other technical and nontechnical factors are certainly important as well.

The large databanks incorporating details of intraoperative events and processes of care suggested by Glance et al. would help determine the numbers and types of events associated with a poor outcome. However, more in-depth qualitative research would be required to determine the basis of differences in outcome. It seems unlikely that such differences are attributable to anesthetic agents; Slogoff and Keats¹⁴ investigated this possibility years ago, with a negative finding. Tachycardia is known to contribute to perioperative myocardial ischemia in patients undergoing both cardiac¹⁵ and noncardiac surgery.¹⁶ But if untreated tachycardia did emerge as an explanatory factor, would this reflect ignorance, lack of vigilance, indecisiveness, or poor communication on the part of the anesthesiologist? Simulation would be a powerful way of exploring such an issue further and perhaps also for addressing poor performance through targeted training.¹⁷

IF THIS OBSERVATION IS TRUE, WHAT SHOULD BE DONE ABOUT IT?

How can we help low-performing cardiac anesthesiologists function more like their high-performing colleagues? This depends on whether the primary locus of occupational control for these practitioners is internal (individual, collegial) or external (bureaucratic, societal). We suspect that it is most likely internal, with low-performing anesthesiologists basing decisions on their individual experiences and opinions, rather than the expectations and values of their colleagues, the requirements of their managers or the opinions of their patients and the community. The challenge here is

not to abolish individual autonomy in tailoring care to the needs of individual patients, but to align practices with professional and bureaucratic controls so that the 2 objectives become complementary and synergistic, and the team functions consistently and well. Team training using simulation may assist in meeting this objective.

It is increasingly apparent that unjustifiable variation in practice is common in health care generally. Variation that reflects differences among patients is desirable, but variation that reflects idiosyncratic differences in approach among physicians leads to overall poorer outcomes.¹⁸⁻²¹ Cardiac surgery has only recently emerged from an era of invention and innovation and entered an era in which standardization of approach is the norm. This standardization should apply as much to cardiac anesthesiologists as cardiac surgeons and should include not only the protocols for care but also minimal standards for credentialing as a cardiac anesthesiologist and a minimal case load to maintain the required skills. In this regard, we doubt that 50 cases in an 18-month period would normally be a reasonable lower limit; after all, this number can be achieved in less than half a day a week, which is unlikely to be enough to embed an anesthesiologist into the fabric of a highly functioning cardiac surgical team.

The best way to improve the performance of cardiac anesthesiologists is to create good ones in the first place. The "nontechnical" aspects of anesthesiology are now widely taught and assessed in anesthesiology training programs around the world. Those intending to pursue cardiac anesthesiology require immersion in cardiac anesthesiology and echocardiography fellowship programs. These competencies need to be maintained through continuing professional development and through a sufficiently high volume of practice. Anesthesiologists entering new fields of practice or with recency of practice issues, and those with performance issues, may benefit from reimmersion in a suitably supervised environment. Those who cannot perform at a sufficiently high level despite remediation might need to retire from cardiac anesthesiology.

Notwithstanding these remarks about the training and remediation of individual practitioners, we think that the recent emphasis on the results of individuals that has occurred in some countries, particularly in respect of cardiac surgeons, is highly undesirable. In our view, it would be unfortunate if the work of Glance et al. resulted in cardiac anesthesiologists' results being publicized in a similar way. Placing data of this sort that emphasize the individual rather than the team into the public domain can only serve to promote individualistic behavior. The public has a right to know about the results of cardiac surgical units and has a right to be reassured that all practitioners in any given unit are achieving acceptable outcomes. Publishing aggregated data for units (i.e., teams) should promote teamwork and be much more likely to result in overall improvement in outcomes. The results of individuals within the team should be analyzed of course, and the information used within the unit, constructively and sensitively, and using appropriate statistical methods, to ensure that all members of the team maintain acceptable workloads and achieve appropriate outcomes.¹ In cardiac surgery and anesthesiology, the motto must be "all for one and one for all." ■■

DISCLOSURES

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