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Myocardial Infarction After Vascular SurgeryA Systematic Troponin Surveillance and a Uniform Definition Is Needed Reply

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1. Azam M, Shenoy R. The role of arthroscopic partial meniscectomy in the management of degenerative meniscus tears: a review of the recent literature. *Open Orthop J*. 2016;10:797-804.

2. Sihvonen R, Paavola M, Malmivaara A, et al; Finnish Degenerative Meniscal Lesion Study (FIDELITY) Group. Arthroscopic partial meniscectomy versus sham surgery for a degenerative meniscal tear. *N Engl J Med*. 2013;369(26):2515-2524.

3. Thorlund JB, Juhl CB, Roos EM, Lohmander LS. Arthroscopic surgery for degenerative knee: systematic review and meta-analysis of benefits and harms. *BMJ*. 2015;350:h2747.

4. Brignardello-Petersen R, Guyatt GH, Buchbinder R, et al. Knee arthroscopy versus conservative management in patients with degenerative knee disease: a systematic review. *BMJ Open*. 2017;7(5):e016114.

5. Stahel PF, VanderHeiden TF, Kim FJ. Why do surgeons continue to perform unnecessary surgery? *Patient Saf Surg*. 2017;11:1.

6. Sihvonen R, Paavola M, Malmivaara A, et al. Arthroscopic partial meniscectomy vs placebo surgery for a degenerative meniscus tear: a 2-year follow-up of the randomised controlled trial. *Ann Rheum Dis*. 2017;77(2):188-195.

COMMENT & RESPONSE

Myocardial Infarction After Vascular Surgery: A Systematic Troponin Surveillance and a Uniform Definition Is Needed

To the Editor The article by Juo et al[1] addresses the important issue of temporal trends in perioperative myocardial infarction after high-risk vascular surgery. We congratulate the authors on their contribution; however, we have some reservations concerning the methods of this study.

Definitions of myocardial infarction used in the database are out of date in light of recent developments in perioperative cardiac monitoring. The diagnostic threshold for myocardial infarction in the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) cohort was defined as new elevation in troponin values greater than 3 times the upper level of the reference range. Furthermore, troponin levels were not measured routinely but only when the clinicians suspected ischemia. The problem with this approach is that 65% of perioperative myocardial infarctions are asymptomatic.[2]

Additionally, the NSQIP Myocardial Infarction and Cardiac Arrest (MICA) calculator, which was used by the authors to estimate the risk of cardiac complications,[1] has never been externally validated in an adequately powered study. Unfortunately, it was derived using the same nonstandard definition of myocardial infarction, which raises similar methodological concerns. Moreover, the NSQIP MICA calculator has poorer performance for vascular surgery compared with other types of noncardiac surgery, which makes the use of the calculator in this population questionable.

In an article published in 2017 in *JAMA*,[3] VISION study investigators showed that even minor troponin elevations, such as these excluded by the American College of Surgeons NSQIP, are independently associated with an increased risk of 30-day mortality. The effect of these findings on clinical practice is reflected in the 2017 Canadian Cardiovascular Society recommendation for systematic troponin monitoring in high-risk patients undergoing noncardiac surgery.[4]

Biccard et al[5] prospectively investigated the incidence of cardiac complications in patients undergoing vascular surgery using routine perioperative troponin monitoring. Their study demonstrated an 8% rate of perioperative myocardial infarction diagnosed according to the Universal Definition of Myocardial Infarction,[5] which is more than 4-fold higher than the rate reported in the study by Juo et al.[1] In our opinion, this discrepancy largely derives from the outdated diagnostic approach used in the American College of Surgeons NSQIP.

Although the authors' findings that the incidence of perioperative myocardial infarction did not decrease over the last decade likely stands,[1] their reported rate of perioperative myocardial infarction should be viewed with caution. Systematic troponin monitoring after vascular surgery, along with the use of the Universal Definition of Myocardial Infarction, should be promoted to warrant a more standardized reporting of this complication.

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1. Juo Y-Y, Mantha A, Ebrahimi R, Ziaeian B, Benharash P. Incidence of myocardial infarction after high-risk vascular operations in adults. *JAMA Surg*. 2017;152(11):e173360.

2. Devereaux PJ, Xavier D, Pogue J, et al; POISE (Perioperative Ischemic Evaluation) Investigators. Characteristics and short-term prognosis of perioperative myocardial infarction in patients undergoing noncardiac surgery: a cohort study. *Ann Intern Med*. 2011;154(8):523-528.

3. Devereaux PJ, Biccard BM, Sigamani A, et al; Writing Committee for the VISION Study Investigators. Association of postoperative high-sensitivity troponin levels with myocardial injury and 30-day mortality among patients undergoing noncardiac surgery. *JAMA*. 2017;317(16):1642-1651.

4. Duceppe E, Parlow J, MacDonald P, et al. Canadian Cardiovascular Society guidelines on perioperative cardiac risk assessment and management for patients who undergo noncardiac surgery. *Can J Cardiol*. 2017;33(1):17-32.

5. Biccard BM, Scott DJA, Chan MTV, et al. Myocardial injury after noncardiac surgery (MINS) in vascular surgical patients: a prospective observational cohort study [published online May 8, 2017]. *Ann Surg*.

In Reply We read with great interest the letter by Polok et al regarding our article[1] and appreciate their insightful comments, which highlight several challenges in the use of retrospective databases for quality monitoring. However, several key factors deserve further consideration.

The initial question prompting our study was whether recent innovations in research and technology translated into actual improvements in patient outcomes from 2005 to 2014. To objectively answer this question, we used the largest longitudinally collected and validated surgical database in the United States, the American College of Surgeons National Surgical Quality Improvement Program.[2] However, as surgical practice has evolved over time, so too have methods of data collection. For example, our study covered trends from 2005 to 2014, during which time the definition of postoperative myocardial infarction was modified twice.[3] In our study,[1] definitions for events were standardized per National Surgical Quality Improvement Program registry definitions and protocols, which is itself constantly evolving to optimize modeling and adjust for complex patient and procedural risk profiles.[4] We acknowledge the challenges in maintaining consistency of myocardial infarction definition across the study period. Yet this point leads to one of our highlighted findings: the Myocardial Infarction and Cardiac Arrest calculator, initially developed and validated prior to the most recent revision of the myocardial infarction definition,[5] was found to consistently underestimate myocardial infarction risk.[1] We agree with Polok et al that higher-quality cohort data with uniform characterization of patient characteristics and adjudication of postoperative events would be ideal for developing and validating future risk assessment tools.

Polok et al alluded to the potential prognostic implications of minor troponin elevations. While recent studies may indicate an association between troponin elevations and mortality,[6] the specificity of this biomarker elevation remains an issue of contention. Other conditions, such as congestive heart failure, pulmonary embolism, myocarditis, and sepsis, have all been associated with elevated troponin levels.[3] Currently available evidence does not support the routine use of high-sensitivity troponin panel in the postoperative period because it does not necessarily produce management-altering information.

In conclusion, shifting practice norms in our rapidly changing surgical environment inevitably lead to evolving disease definitions in clinical data repositories. This will continue to be an important consideration when evaluating evidence from retrospective studies. Nonetheless, in the whirlwind of disruptive technologies and publications, objectively collected outcomes data remain the best measure by which to evaluate whether actual progress is being made in the delivery of health care, the ultimate goal of all modern medicine.

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1. Juo Y-Y, Mantha A, Ebrahimi R, Ziaeian B, Benharash P. Incidence of myocardial infarction after high-risk vascular operations in adults. *JAMA Surg*. 2017;152(11):e173360.

2. Mansmann U, Rieger A, Strahwald B, Crispin A. Risk calculators: methods, development, implementation, and validation. *Int J Colorectal Dis*. 2016;31(6):1111-1116.

3. Royo MB, Fleisher LA. Chasing myocardial outcomes: perioperative myocardial infarction and cardiac troponin. *Can J Anaesth*. 2016;63(2):227-232.

4. Cohen ME, Ko CY, Bilimoria KY, et al. Optimizing ACS NSQIP modeling for evaluation of surgical quality and risk: patient risk adjustment, procedure mix adjustment, shrinkage adjustment, and surgical focus. *J Am Coll Surg*. 2013;217(2):336-346.e1.

5. Gupta PK, Gupta H, Sundaram A, et al. Development and validation of a risk calculator for prediction of cardiac risk after surgery. *Circulation*. 2011;124(4):381-387.

6. Gillmann H-J, Meinders A, Grohennig A, et al. Perioperative levels and changes of high-sensitivity troponin T are associated with cardiovascular events in vascular surgery patients. *Crit Care Med*. 2014;42(6):1498-1506.

Cultural Sensitivity in Deployed US Medical Personnel

To the Editor I read with interest the Research Letter by Weeks et al[1] in which surgeons from the US military have delivered humanitarian surgical care to local national civilians in war zones. The authors raise the important issue of preparing US surgeons for deployment.

Cultural sensitivity is critical in these endeavors, in particular for deployed medical personnel.[2] There are many different potential culture clashes that deployed troops can experience in a religious and conservative country.[3] It has been well documented that some US troops' misunderstanding of Iraqi culture when they first entered into the region led to failure of "winning hearts and minds."[4]

It is clear that armed forces should ensure that their personnel receive sufficient training to appreciate cultural differences while working in hostile environments. To this effect, the Uniformed Services University of the Health Sciences has initiated a formal international elective with the Armed Forces Medical College in Pune, India, to conduct a pioneering medical and cultural venture through clinical work and research.[5] Several medical students have undertaken electives in uniform living on the campus of the Armed Forces Medical College. The areas of study include orthopedics, pediatric surgery, oncology, autism, and prostatic diseases. The students also gained "experience observing Indian 'jugaad' which in Hindi is a conceptual hybrid of 'making things happen' and 'doing more with less.'"[5]

Cultural adaptability in deployed medical officers is crucial to enhance the mission of the US government and also to understand needs of the local population. Medical students who have undergone formal electives in India may be more culturally sensitive to conditions in Afghanistan because of cultural and ethnic similarities between countries in the Indian