PAUL J. GRANT, MD, SFHM, FACP
Assistant Professor of Medicine, Director, Perioperative and Consultative Medicine, Associate Chief Medical Information Officer, Division of General Medicine, Department of Internal Medicine, University of Michigan Medical School, Ann Arbor, MI

Perioperative medicine: Combining the science and the art

In this issue of the *Cleveland Clinic Journal of Medicine*,[1] Dr. Steven L. Cohn provides a succinct review of the recently published guidelines by the American College of Cardiology and American Heart Association (ACC/AHA) on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery.[2] Although no drastic changes have been made in these guidelines, several significant modifications have been implemented and are highlighted in his review.

See related article, page 742

Although we may desire 'cookbook' guidelines, we need to practice the art of medicine

A BREACH OF SCIENTIFIC INTEGRITY

First, I am pleased Dr. Cohn described how the writing committee of the new guidelines handled the well-publicized breaches of scientific integrity by Dr. Don Poldermans, a prolific perioperative-medicine researcher at Erasmus University in the Netherlands who has contributed an abundance of literature that influenced clinical practice. Although some of his key publications were excluded by the ACC/AHA committee in its overall analysis, it remains unclear to me if simply ignoring *some* of his work is truly possible. For better or for worse, his publications have significantly shaped clinical practice in addition to guiding subsequent research in this field.

ASSESSING RISK

Along with continuing to endorse the Revised Cardiac Risk Index (RCRI),[3] the guidelines now include another option for objective preoperative cardiovascular risk assessment. Dr. Cohn nicely outlines the pros and cons of the surgical risk calculator (often referred to as the "Gupta calculator") derived from the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database.[4]

Although the RCRI is not perfect, I agree with Dr. Cohn that the ACS NSQIP tool has limitations, including a cumbersome calculation (requiring a smartphone application or online calculator), lack of external validation, and use of the American Society of Anesthesiologists Physical Status Classification System, which has been notoriously confusing for generalists and has demonstrated poor interrater reliability among anesthesiologists.[5,6]

Of note, a patient may have very different risk-prediction scores depending on which tool is used. For example, a 66-year-old man with a history of ischemic heart disease, diabetes on insulin therapy, hypertension, and chronic kidney disease with a serum creatinine level greater than 2.0 mg/dL who is scheduled to undergo total hip arthroplasty would have a risk of a perioperative cardiovascular event of about 10% according to the RCRI, but only 1.1% according to the ACS NSQIP calculator. How widely this newer risk-stratification tool will be adopted in clinical practice will be interesting to observe.

In what appears to be an effort to simplify the guidelines, the ACC/AHA now recommends combining the patient's clinical and surgical risks into estimating an overall perioperative risk for developing major adverse cardiac events. This estimate is now whittled down to only two categories: "low risk" and "elevated risk." I am concerned that the new guidelines may have become too streamlined

doi:10.3949/ccjm.81a.14172

and lack the direction to assist providers in making important clinical decisions. Most notably, and as Dr. Cohn appropriately suggests, many patients will be in a gray zone with respect to whether cardiac stress testing should be obtained before surgery.

STRESS TESTING

Significant background knowledge is required to answer the important question in the ACC/AHA algorithm, ie, whether further testing will have an impact on decision-making or perioperative care.[2] Dr. Cohn provides some of this information by noting the abysmal positive predictive value of preoperative noninvasive cardiac testing (with studies ranging from 0% to 37%) and by correctly stating that no benefit has been observed with preoperative cardiac revascularization.

If this is not widely known, I share Dr. Cohn's fear that the new guidelines may stimulate increased ordering of preoperative stress tests. We observed this trend with the highly scripted 2002 ACC/AHA perioperative guidelines[7] and subsequently learned that stress testing before surgery very seldom changes patient management.

A preoperative stress test should be reserved for patients with *symptoms* suggestive of ischemic heart disease. As a *diagnostic* study, the value of stress testing is excellent. This is not true when it is used as a *screening* test for asymptomatic patients, where its ability to predict perioperative cardiovascular events is extremely poor. The only other indication for preoperative stress testing is the rare occasion when further risk stratification is desired for exceptionally high-risk patients. In this scenario, test results may influence the decision to proceed with surgery vs seeking nonoperative approaches or palliative care.

MANAGING MEDICATIONS

Dr. Cohn discusses pertinent issues in the perioperative management of patients' medications, an important component of the preoperative evaluation.

Despite the inconsistent clinical trial results on perioperative beta-blockers, his assessment of their risks and benefits is clinically accurate and practical. Furthermore, I fully agree with Dr. Cohn's thoughtful approach regarding perioperative statins, despite the limited data available from randomized controlled trials.

With respect to perioperative aspirin use, I have concerns with Dr. Cohn's statement that it may be reasonable to continue aspirin perioperatively if the risk of potential cardiac events outweighs the risk of bleeding. Given the result of the recently published second Perioperative Ischemic Evaluation (POISE-2) trial[8] that showed a significantly higher risk of major perioperative bleeding in patients randomized to low-dose aspirin, it is difficult to advocate continuing aspirin when no cardiovascular protection was found in this very large trial. I agree with Dr. Cohn that this applies only to patients with no history of coronary artery stent placement, as patients with a stent should remain on low-dose aspirin throughout the entire perioperative period.

Controversy also surrounds angiotensin-converting enzyme inhibitors and angiotensin receptor blockers. Dr. Cohn agrees with the ACC/AHA guidelines to continue these agents before surgery; however, I favor holding them on the day of surgery. Although the risk of hypotension-induced cardiac events has not been clearly demonstrated, a recent retrospective study involving more than 1,100 patients showed significantly more acute kidney injury (even after adjusting for hypotension) as well as an increased length of hospital stay in the patients exposed to these agents before surgery.[9] Given these findings, in addition to the postinduction hypotension (which can be profound) commonly observed by our anesthesiology colleagues, I recommend holding angiotensin-converting enzyme inhibitors and angiotensin receptor blockers on the day of surgery, with very few exceptions.

A patient may have very different risk prediction scores depending on which tool is used

THE SCIENCE AND ART OF MEDICINE

Dr. Cohn acknowledges that we lack scientific data to answer many questions that arise when caring for the perioperative patient and thus we rely on the ACC/AHA guidelines to provide a framework. These scientific knowledge gaps emphasize the importance of the art of medicine in the perioperative arena. Although we may desire "cookbook" guidelines, the significant gaps in

the perioperative medicine evidence base reinforce the necessity to provide individual patient-level care in a multidisciplinary environment with our surgery and anesthesiology colleagues. Without the proper balance of science and art in perioperative medicine, we sacrifice our ability to deliver optimal care for this high-risk patient population.

REFERENCES

1. **Cohn SL**. Updated guidelines on cardiovascular evaluation before noncardiac surgery: a view from the trenches. Cleve Clin J Med 2014; 81:742–751.
2. **Fleisher LA, Fleischmann KE, Auerbach AD, et al**. 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol 2014; Jul 29. pii: S0735-1097(14)05536-3. doi: 10.1016/j.jacc.2014.07.944. [Epub ahead of print].
3. **Lee TH, Marcantonio ER, Mangione CM, et al**. Derivation and prospective validation of a simple index for prediction of cardiac risk of major noncardiac surgery. Circulation 1999; 100:1043–1049.
4. **Gupta PK, Gupta H, Sundaram A, et al**. Development and validation of a risk calculator for prediction of cardiac risk after surgery. Circulation 2011; 124:381–387.
5. **Aronson WL, McAuliffe MS, Miller K**. Variability in the American Society of Anesthesiologists Physical Status Classification Scale. AANA J 2003; 71:265–274.
6. **Mak PH, Campbell RC, Irwin MG; American Society of Anesthesiologists**. The ASA Physical Status Classification: inter-observer consistency. American Society of Anesthesiologists. Anaesth Intensive Care 2002; 30:633–640.
7. **Eagle KA, Berger PB, Calkins H, et al; American College of Cardiology; American Heart Association**. ACC/AHA guideline update for perioperative cardiovascular evaluation for noncardiac surgery—executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol 2002; 39:542–553.
8. **Devereaux PJ, Mrkobrada M, Sessler DI, et al**. Aspirin in patients undergoing noncardiac surgery. N Engl J Med 2014; 370:1494–1503.
9. **Nielson E, Hennrikus E, Lehman E, Mets B**. Angiotensin axis blockade, hypotension, and acute kidney injury in elective major orthopedic surgery. J Hosp Med 2014; 9:283–288.

***ADDRESS**: Paul J. Grant, MD, SFHM, FACP, 3119 Taubman Center, 1500 E. Medical Center Dr, Box 5376, Ann Arbor, MI 48109;*
e-mail: paulgran@med.umich.edu