

Implications of Preoperative Heart Failure

The Next Frontier in Perioperative Medicine?

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FOR more than three decades, the presence of signs and symptoms of heart failure has been associated with increased perioperative cardiovascular risk for noncardiac surgery. In the original multifactorial Cardiac Risk Index developed by Goldman *et al.*¹ and published in 1977, the presence of an S3 gallop was associated with 11 points, the highest value assigned to any risk factor. Even as recently as the publication of the Revised Cardiac Risk Index, the presence of heart failure remained one of the independent predictors of adverse cardiac outcomes.² Given the wide dissemination of these landmark articles and the inclusion of heart failure as a major clinical predictor in the American Heart Association-American College of Cardiology Guidelines on Perioperative Cardiovascular Care since 1996, is it surprising and somewhat concerning that heart failure is shown to be not only a risk factor but a more important risk factor than coronary artery disease in a study published in this month's Journal by Hammill *et al.*³⁻⁶

Much of the work related to the study of cardiovascular risk has focused on patients undergoing major vascular surgery.^{7,8} The advantage of such an approach is the high rate of adverse cardiovascular outcomes in this surgical group allows the investigators to have sufficient power to find important associations. When studying a more diverse grouping of noncardiac surgeries with lower perioperative risk, it becomes important to obtain larger data sets to assess these associations with more precision. The article published in this month's Journal uses an analysis of large administrative data sets, specifically Medicare data, to accomplish these goals. Analysis of administrative data has its limitations in that it has not

been collected for the purpose of research but does offer the opportunity to analyze large number of patients and generate important hypotheses or observations.⁹ By using longitudinal data that allow the investigator to link previous admissions to the noncardiac surgery, the investigative team is able to better assess comorbidities with some degree of confidence.

Given the use of administrative data, it was important to choose outcomes that are robust and would be collected in a similar manner. Hammill *et al.* clearly achieved this goal. Mortality is the most important outcome and can easily and accurately be obtained from the Medicare and Social Security data files. Given the inclusion of all covered medical care for a given individual in the data sets, the second outcome of interest, readmission within 30 days, can also accurately be obtained. A key issue is that the current study reports all-cause mortality and all readmissions. Perioperative mortality and admission within 30 days may be the result of patient disease and surgical and anesthesia etiologies. One approach to linking these outcomes to potential etiologies is the use of billing codes for complications and comorbidities, as the authors have done in the determination of the presence of heart failure or coronary artery disease. However, surveillance for perioperative cardiac events is poor, and the frequency with which any detected event is actually entered into the discharge summary and coded on the Medicare claim form further questions the utility of such an approach. Therefore, the investigators chose to report all-cause outcomes and cannot link patient disease and outcome. Therefore, Hammill *et al.* have presented an extremely important hypothesis-generating study, and much additional work must be done to confirm this link so that the information can be used to inform future research and clinical care.

So, if the hypothesis is correct and heart failure, even in the absence of coronary artery disease, is an important predictor of adverse outcome, the question remains whether focused efforts on reducing the complications of heart failure in the perioperative period would actually result in a reduction in 30-day mortality and subsequent admissions. The past decade has been marked by increasing enthusiasm for perioperative interventions to reduce complications of coronary artery disease. For example, administration of β -blockers had recently been advocated for all patients currently not taking β -blockers but at risk for coronary artery disease.¹⁰ With the recent presentation of the Perioperative Ischemic Evaluation (POISE) study, this enthusiasm has been significantly dampened as investigators attempt to determine whether the

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increased mortality and stroke seen in the β -blocker group are a result of dosage, timing of initiation of β -blockers, or any particular patient risk profiles¹¹ (Philip J. Devereaux, B.Sc., M.D., Assistant Professor, Department of Clinical Epidemiology and Biostatistics, Joint Member, Department of Medicine, McMaster University, Hamilton, Ontario, Canada, verbal communication, November 2007). It may even be possible that the enthusiasm to provide perioperative β -blockers to those currently not taking these agents may have resulted in worsening of heart failure.

The key question is whether we have any perioperative interventions to reduce risk from heart failure or whether we will observe a similar enthusiasm and subsequent caution for these interventions as observed in the β -blocker story. For example, use of pulmonary artery catheters to reduce complications of heart failure and significant coronary artery disease could be extrapolated by the work of Rao *et al.*¹² However, recent large-scale cohort and randomized trials were unable to demonstrate any benefit with potential increased risk of heart failure.^{13,14} The one firm conclusion that can be made is that additional studies are needed that focus on patients with heart failure. POISE has taught us that these studies should include large numbers of patients to avoid any potential error from a lack of power to detect any detrimental side effects as opposed to focusing solely on reduction in primary outcomes.

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