Predicting Perioperative Risk and Informed Consent

To the Editor:

Providing accurate and adequate information to patients to allow informed consent is a cornerstone of modern surgical and anesthetic practice. Recently Glance et al developed a simple risk model to provide information on perioperative risk that they propose has utility to compare hospital outcomes and also to inform patients of their risk at the bedside.1 Glance et al’s model is developed and validated on a large cohort of administrative data and is based on simple variables such as the ASA (American Society of Anesthesiologists) grade, type of operation, and emergency status of the operation. Strengths include the simplicity of the score and excellent discrimination. However, we believe that their model has some important limitations, particularly for providing informed consent.

First, any model that focuses on perioperative risk relating to noncardiac surgery without further classification is inherently flawed for informing a patient about their personalized risk for a specific procedure. Inclusion of variables about type or emergency status of an operation increases imprecision for judging perioperative risk for an individual procedure. Indeed, patients typically present for a specific surgery in either an elective or emergency fashion, not a choice between surgical procedures: one would not discuss aortic surgery but you are fine for a hip replacement or hysterectomy….” Rather, risk scores should focus on the individual procedure being proposed or the surgical and anesthetic options for treating an individual if the goal is to enhance informed consent. The vastly different risks of emergency versus elective procedures are a case in point, mortality from elective hip replacement is 0.2%,2 but perioperative mortality from hip fracture approaches 7.7% in the United Kingdom (National Hip Fracture Database, Annual Report, 2010). Even if fractures treated with hip replacement are considered, mortality (1.4%)3 is still sevenfold higher than that from elective hip replacement. It is surprising that the difference in mortality between elective and emergency procedures can be adequately captured by one point on the Surgical Mortality Probability Model. We would welcome some examples of accurate risk prediction for emergency surgery. In this era of personalized medicine, and to provide accurate information for consent, we should devise risk scores that focus on a procedure-specific risk.3

Second, although the ASA class is a reasonable summary of comorbidity, it—by its nature—inaccurately groups diseases. Furthermore, ASA class assumes equivalence between comorbidities, but it is clear that this is not the case. We have recently seen that liver disease increases the perioperative mortality from total hip or knee replacement eightfold,3 aortic abdominal aeurysm surgery sixfold,3 and cardiac artery bypass grafting 20-fold;3 far greater than levels associated with cardiac disease for example.3 Therefore use of the ASA class, rather than focus on specific comorbidities, makes a huge difference for patients with specific conditions such as liver disease, as models such as the Surgical Mortality Probability Model1 likely underestimate their risk. Nonetheless, we accept that the simplicity of the Surgical Mortality Probability Model score is attractive as it only has a few variables. We have recently seen that 5 variables predict perioperative risk from aortic abdominal aeurysm surgery (liver disease, renal failure, heart failure, nonatrial fibrillation arrhythmia, and peripheral vascular disease) and so it is plausible to produce simple risk scoring schemes for all-cause mortality for specific procedures.3 However, we have not constructed a risk model as we believe it is limited without validation on a prospective cohort of patient data.

Finally, we agree that Glance et al’s model, which is derived from administrative data, could have a role in benchmarking surgical outcomes at a hospital level but argue the imprecision induced by using administrative data requires validation in prospective cohorts.5 We therefore agree with Glance et al that “Unfortunately, models based on administrative data may generate biased measures of hospital performance due to poor data quality.” Therefore, before implementation, prospective validation is required. We also urge the authors to refine their analyses by focusing on individual surgical procedures, whether emergency or elective, to obtain more accurate risk prediction for patients presenting for a specific surgery. The category of “non-cardiac” surgery should be viewed as an outdated concept as patients and clinicians demand better information for informed consent.

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REFERENCES

Reply:

We appreciate the opportunity to respond to the comments by Manning and colleagues. We fundamentally agree that surgery prediction models need to accurately predict outcomes if they are used for conveying accurate risk information to patients.

Manning argues that our model—the Surgical Mortality Probability Model (S-MPM)3—is “inherently flawed” because it does not adjust for the surgical procedure. We agree that surgery risk scores should provide information on “procedure-specific” risk. In fact, S-MPM does adjust for surgery-specific risk according to whether a procedure is low, intermediate, or high risk. These risk designations were empirically determined for groups of similar surgeries using a regression-based approach.

We also agree with Manning and colleagues that the ASA Physical Status is not a perfect measure of comorbidity. We used the

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ASA Physical Status as a summary measure of comorbidities and disease severity because of its simplicity, and because it is one of the single most important predictors of mortality and morbidity after general surgery.\textsuperscript{2,3} Despite the fact that we use summary measures of comorbidity and surgery-specific risk, S-MPM exhibits excellent discrimination and calibration in a cohort of nearly 300,000 patients undergoing a broad spectrum of noncardiac surgeries. In fact, our model, which has only 3 risk factors (ASA physical status, emergency status, and surgery risk class), exhibits superior calibration and nearly identical discrimination to the full 35-variable American College of Surgeons (ACS) National Surgical Quality Program (NSQIP) model (which does include specific terms for comorbidities).

Manning and colleagues also failed to appreciate the fact that S-MPM is based on clinical data, not administrative or billings data. In their Letter to the Editor, they state that our prediction model “is derived from administrative data.” In fact, S-MPM was developed using the ACS NSQIP Database: “trained surgical clinical reviewers collect patient data from the medical chart, operative log, anesthesia record, interviews with the surgical attending, and telephone interviews with the patient.”\textsuperscript{1}

We do, however, understand Manning and colleagues’ intuitive reluctance to embrace simple scoring systems for prognostication, especially given the importance of conveying accurate prognostic information to patients as part of informed consent discussion. We share their belief that accurate risk information is absolutely central to shared decision making. Our model does provide risk predictions that are nearly as accurate as a much more comprehensive model. Nonetheless, the ASA physical status, as powerful predictor as it is, is fairly subjective: there is a fair amount of variability across physicians.\textsuperscript{4} And, because ASA physical status is 1 of only 3 predictors in S-MPM, “getting it wrong” for an individual patient will have a tremendous impact on the accuracy of mortality prediction. The reason to use simple risk scores is that they are simple to use and do not require computers. But, today very few clinicians currently lack access to powerful handheld devices that can be programmed to accurately predict outcomes based on complex models. So, we would also support the use of less subjective, more complex risk scores such as the recently introduced ACS NSQIP Surgical Risk Calculator\textsuperscript{5}—which is available online, and is thus immediately accessible to any clinician with an Internet-enabled handheld device.

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