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Invited Commentary

Strengths and Limits of Risk Stratification Models in Vascular Surgery

P. Kolh*

University of Liège Hospital (CHU ULg), Cardiovascular Surgery Department, CHU B35 Sart Tilman, B 4000 Liège, Belgium

As older patients with significant comorbidities are increasingly undergoing elective open or endovascular repair to prevent abdominal aortic aneurysm (AAA) rupture, accurate preoperative stratification of the operative risk is of major importance. In fact, AAA surgery is associated with variable postoperative mortality and morbidity rates, related to the invasive nature of surgery, the frequent existence of severe comorbidities, the experience of surgeons and anaesthesiologists caring for the patients, and the hospital procedural volume. The prognostic weight of each of these factors remains controversial and difficult to measure although numerous operative risk scores have been developed, mostly to assess the impact of comorbidities on short-term results. The widespread use of these risk scores has been hampered by their complexity, lack of validation in larges studies or low accuracy.

Each of these scores has relative strengths and drawbacks, well summarised by Patterson et al.[1] The Glasgow Aneurysm Score (GAS) is easy to use at patient bedside, has been validated more consistently than any other method and can potentially predict long-term outcome. However, it performs poorly in discriminating high-risk patients, does not predict mortality well and has not been reliably validated for endovascular repair. Vascular Physiological and Operative Severity Score for enUmeration of Mortality (V-POSSUM) is a validated audit tool and appears accurate, in some studies, for preoperative prediction. The drawbacks include the large dataset, the inclusion of subjective elements (i.e. estimation of dyspnoea), and the need for operative data for most models. Vascular Biochemical and Haematological Outcome Model (VBHOM) uses a minimal dataset, has been validated and is highly accurate, but the early model displayed poor calibration. Estimation of Physiological Ability and Surgical Stress Score (E-PASS) requires a small dataset and is highly accurate for mortality and morbidity, but requires further validation.

In this issue of the *Journal*, Bryce et al,[2] assessed the ability of five risk indices to quantify the risk of Major Adverse Cardiac Events (MACE) and death prior to making decisions about prophylactic open AAA repair among a population of 106 patients (a rather small size) in the West of Scotland. They found that GAS, VBHOM, and Revised Cardiac Risk Index (RCRI) did not predict outcome, while the more complex indices V(p)-POSSUM and E-PASS were reasonable predictors of MACE, cardiac death, and all-cause mortality.

The finding that GAS, the simplest score often considered as the most useful for a quick risk stratification during patient consultations,[3] did not predict in the population it was devised is certainly of concern and may be indicative of a changing populace, questioning the utility of decision-making based on this risk index. Usually, risk models predict outcome more accurately in the original setting than when used for other populations of patients. Indeed, there are significant differences with regard to the initial patient population on which the score design was based. Predictive values for older scoring algorithms are usually poorer as compared to more recent ones, because of medical and surgical therapy advances achieved in this period. Therefore, revalidation of score items at regular intervals is most likely necessary.

A novel risk prediction system for open and endovascular repair, based on physiological and anatomical variables and validated in different geographic areas, would certainly assist the clinical practice of AAA repair. It could also be used for audit case-mix, and a measure of utility, such as the quality-adjusted-life-year (QALY), could be incorporated to aid cost-effectiveness analysis.[1] As suggested by Sutton et al.,[4] a risk assessment scoring system should be accurate, quick, and easy to use at the patient bedside, and should include a small number of variables which are available for every patient, be in common use across the healthcare system and leave little room for observer bias.

The predictive accuracy of all risk score algorithms is influenced by numerous factors, including variable definitions, management of incomplete data field, geographic differences in patient risk factors, and surgical procedure selection criteria. In this regard, preoperative risk stratification models are useful tools to compare quality in different centres and to assess costs related to patients' severity. Data collection and risk stratification are of paramount importance for proper quality assessment and outcome improvement in vascular surgery. Risk stratified data are essential for quality analysis, meaningful comparison of outcomes and improvements of outcomes. It should be an integral part of the vascular surgical practice, being as essential to the surgeon as the knowledge of anatomy and techniques. It belongs to risk assessment, decision-making and informed consent.

However, vascular surgeons should bear in mind that, when using predictive models at bedside to provide the patient with an estimate of surgical risk, they assign a reliable probability of death of a population and not for the actual patient. It should also be

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* Tel.: +32 4 366 7163; fax: +32 4 366 7164.
E-mail address: philippe.kolh@chu.ulg.ac.be.

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underlined that risk stratification models score the risks of care, but not the quality of care.

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