

## Predicting outcome

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The primary goal in risk prediction is to take a population risk prediction and convert this to a risk prediction for an individual. This is the concept of converting the pretest probability of the population to that of a post-test probability for the individual.

In order to maximise the ability to predict risk, four issues need to be considered:

- Whether the risk prediction is warranted, and if so, then to determine if.
- The patient is predisposed to the outcome of interest.
- What perioperative or dynamic factors, increase or decrease the patient's predicted risk of sustaining such an event.
- Finally, determine whether the patient has had such an adverse event.

An understanding of perioperative cardiovascular complications in non-cardiac surgery will be used to illustrate these principles.

It is suggested that three factors determine whether one should consider proceeding with a test or a treatment:

- The properties of the test (cost, accuracy and safety)
- The prognosis of the disease
- The nature of the treatment.<sup>1</sup>

A test that is cost-effective and reliable in the presence of a disease with a poor prognosis, and that offers reasonably priced, safe therapy, would demand testing in patients. Perioperative cardiovascular complications are common and associated with considerable morbidity. Therefore, this warrants accurate risk prediction to identify patients at risk.

It has been recognised that a patient undergoing non-cardiac surgery has to have a risk factor for cardiovascular disease in order to be at risk of an adverse cardiac outcome.<sup>2</sup> Unfortunately, clinical risk factors can only exclude patients at risk of cardiovascular events.<sup>3,4</sup> This is because a number of perioperative or dynamic factors have a large influence on the risk of an adverse event in a patient.

There are a number of examples in the perioperative literature of how perioperative risk factors strongly modify the risk of a cardiac event, increase the performance of risk prediction models, and decrease the prognostic performance of preoperative cardiac risk factors.<sup>3,5-7</sup>

Finally, it is important to realise that in most circumstances, a single appropriate prognostic test prior to surgery does not exist. Rather, as the patient moves through the perioperative period, the most appropriate test will become apparent. It is important to embrace the concept of continuous risk prediction in the perioperative period. This is because, potentially, there are a number of pathways or pathophysiological mechanisms that could lead to an adverse perioperative cardiovascular outcome. When attempting to predict perioperative cardiovascular events, preoperative brain natriuretic peptide (BNP) may be a better predictor of postoperative cardiac complications, than troponins.<sup>8</sup> Preoperative BNP elevation identifies a vulnerable ventricle at risk of a major adverse cardiac event, while troponin elevations most commonly reflect myocyte necrosis as a final common pathway of a damaged ventricle. However, once an adverse event is believed to have occurred, a diagnostic test (such as troponin evaluation) is preferable.

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