



## Editorial

## Revised cardiac risk index—a simple universal tool for peri-operative risk prediction

N.V. Deshpande\*

*Director, Cath Lab, Spandan Heart Institute and Research Center, Dhantoli, Nagpur – 440012, India.*

Patients subjected to non-cardiac surgery are at a significant risk to develop cardiac complications. With aging populations and improved surgical and anaesthesia techniques, even elderly populations are frequently considered for non-cardiac surgery today. It is estimated that about 40 million non-cardiac surgeries are performed in Europe annually and the peri-operative myocardial infarction (MI) occurs at a rate of 1% causing 400,000 myocardial infarcts. Further, the cardiovascular mortality rate of 0.3% gives mortality of 133,000 annually related to non-cardiac surgery.<sup>1</sup> It is also a well-known fact that the peri-operative complications are more frequent following vascular surgery.<sup>2</sup> Number of risk assessment algorithms have been developed and tested, however the revised cardiac risk index (RCRI)<sup>3</sup> described by Lee et al. in 1999, remains the most used risk assessment model. These indices are predominantly based on history and simple clinical tools. Patients with active cardiac conditions like, unstable angina or severe angina, recent MI (within 30 days), significant arrhythmias (advanced heart blocks, atrial fibrillation with uncontrolled ventricular rate, symptomatic ventricular arrhythmias, and symptomatic bradycardia), and severe valvular disease undergoing planned non-cardiac surgery, need to be evaluated extensively, and at times, this may lead to postponement or cancellation of the planned surgery.<sup>4</sup> Patients with risk factors as indicated by the risk scores but without active cardiac conditions need to be evaluated further to prevent postoperative cardiovascular events. A pooled analysis of several studies found a 30-day incidence of cardiac events (postoperative MI and death) of 2.5% in unselected patients >40 years of age.<sup>2</sup> Incidence of postoperative cardiac events varies widely depending upon the tools used to detect myocardial damage as the events may occur silently. Use of sensitive markers like troponins, can detect largely asymptomatic cardiac events.<sup>1</sup> Such patients have higher 6-months event rates as compared to those who do not show elevation of troponins following

non-cardiac surgery. Risk assessment prior to planned non-cardiac surgery can help in predicting the postoperative events. It also helps the physician and anaesthesiologist to take necessary precautions to minimise the postoperative events.

In this issue of the journal Jayakeerthi et al.<sup>5</sup> have reported their experience of pre-operative risk evaluation on 920 patients referred for cardiac assessment. They used RCRI proposed by Lee et al. in 1999<sup>3</sup> for prediction of cardiac events following surgery in 853 patients. The RCRI was described for planned non-cardiac surgery patients, whereas, the cohort described in the current report includes emergent surgical procedures in addition to elective surgeries, which the authors believe reflects the real world. The number of emergency surgeries was relatively small (40/853). Electrocardiogram (ECG) monitoring was done for all patients (pre-operative, immediate postoperative and 1st postoperative day) in addition to troponin estimation in intermediate and high-risk patients. This resulted in event rate of 3% which comprised primarily of non-ST-segment elevation MI (NSTEMI) (63% of the events). Inclusion of troponin positivity as a postoperative event might have lead to high overall event rate of 3%. Similar observations were made by Poldermans et al.<sup>1</sup> The event rate increased markedly as the RCRI class increased, which confirms with the earlier studies and clinical experience. Further, analysis done by the authors show that the postoperative events were more common in older individuals, in patients with history of ischaemic heart disease, in patients undergoing emergency surgery and in patients with poor general medical status at surgery. Overall, RCRI was found to be a useful tool and the authors suggest addition of age, emergency surgery, and general medical condition to improve upon the risk prediction.

Although, this seems to be the first large experience of risk assessment from our country, number of large scale data is available from Europe and North America. Boersma et al.<sup>6</sup> reviewed the records of 108,593 patients undergoing non-cardiac surgery at Erasmus University database from 1991–2000 and found that RCRI was a good predictive tool and the

\*Corresponding author.  
E-mail address: nvdes@hotmai.com

accuracy could be improved by adding age and type of surgery to the RCRI. The American College of Surgeons' National Surgical Quality Improvement Programme (NSQIP) database was used to determine risk factors associated with intra-operative/postoperative MI or cardiac arrest (MICA). The model was developed from a database of >200,000 non-cardiac surgeries performed in 2007 and validated on 2008 dataset.<sup>7</sup> On multivariate logistic regression analysis, type of surgery, dependent functional status, abnormal creatinine, American Society of Anesthesiologists' class and increased age were identified as predictors of MICA. The risk model developed from these indicators was found to outperform the RCRI (*c* statistics of 0.87 vs 0.74 for RCRI). An easy to use calculator is developed from this model and is available on the web ([www.surgicalriskcalculator.com](http://www.surgicalriskcalculator.com)). This calculator is the most recent which reflects the peri-operative cardiovascular risk in the current era.

In summary, the author's effort to document the postoperative cardiac events in a large database needs to be applauded. It is noteworthy that they have used ECG surveillance and troponin monitoring to detect the postoperative cardiac events, which albeit has given a higher event rate as compared to the standard existing literature. However, it is important to recognise silent myocardial injury in postoperative patients, as it has a significant impact on intermediate term outcome. This article highlights the importance of using appropriate risk models, especially in countries like India, where the medical practice is nursing home-based. Once patient is identified as higher risk (RCR class >3), appropriate care can be taken to

manage such a patient, including shifting such patients to a tertiary care centre for the required surgery. Such simple actions can help all of us to manage postoperative more effectively reducing morbidity and mortality.

## References

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