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Editorial

# Need to Design a Tool that can Assess Preoperative Factors which may Affect Cardiac Complications after Non-Cardiac Surgeries among CKD Patients

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## Editorial

Each year, cardiac complications occur within 30 days after major non-cardiac surgery in more than 10 million people worldwide [1,2].

Non Cardiac surgeries may improve the quality and patient's life may get better or prolonged, however these surgeries may develop complications such as death from Cardiac causes, myocardial ischemia (MI), cardiac arrest or conjuctive heart failure [2]. Unfortunately, a large proportion of ischemic episodes go undetected during surgery and in the postoperative period. Also, it is noticed that MI remains undiagnosed and physicians rarely administer therapy and plan secondary prevention in patients who have suffered from perioperative unstable angina or MI. The risk of subsequent cardiac events increases further due to lack of satisfactory management [3].

Knowing the clinical relevance of cardiac complications in the setting of non-cardiac surgery, preventive strategies for preoperative risk stratification have been proposed since 1977. Models were developed looking for associations between preoperative variables such as age, type of surgery, co-morbidities etc and the risk of cardiac complications in a cohort of patients undergoing non-cardiac surgeries called as "Derivation Cohort". Variables that have independent predictive value using logistic regression analysis are incorporated into the risk index. The accuracy and validity of this risk index is then tested in a separate cohort called "validation cohort".

To determine which preoperative factors might affect the development of cardiac complications after major non-cardiac operations, Lee Goldman et al prospectively studied 1001 patients over 40 years of age. They identified nine independent significant correlates of life-threatening and fatal perioperative cardiac complications. These nine factors are: preoperative third heart sound or jugular venous distention; MI in the preceding six months; more than five premature ventricular contractions per minute before operation; rhythm other than sinus or presence of premature atrial contractions on preoperative electrocardiogram; age over 70 years; intraperitoneal, intrathoracic or aortic operation; emergency operation; important valvular aortic stenosis; and poor general medical condition. This was the Original Cardiac Risk Index [OCRI] (or alternatively the Goldman Index) in 1974. Patients could be categorized in four different classes of risk [4].

In 1999, Lee TH et al. published Revised Cardiac Risk Index (RCRI). This was derived from 2893 patients undergoing major non-cardiac surgery, which was later validated in 1422 patients aged ≥ 50 undergoing major non-cardiac surgery [5]. Type of major cardiac complications detected were, abdominal aortic aneurysm, other vascular, Thoracic, abdominal, orthopedic, and others. Lee identified six independent variables that predicted an increased risk for cardiac complications. They were: high-risk type of surgery, history of ischemic heart disease, history of congestive heart failure, history of cerebrovascular disease, preoperative treatment with insulin, and preoperative serum creatinine >2.0mg/dL. Rates of major cardiac complication with 0, 1, 2, or 3 of these factors were 0.5%, 1.3%, 4% and 9% respectively, in the derivation cohort and 0.4%, 0.9%, 7% and 11% in validation Cohort respectively. RCRI demonstrated that even if patients do not have major perioperative cardiac complications, patients with at least 3 of the factors (history of ischemic heart disease, history of congestive heart failure, and diabetes mellitus) have an increased risk for cardiovascular complications during the next 6 months. RCRI is much easier to use compared to OCRI and at present it is the most commonly used cardiac risk stratification tool.

Recently (2011) Dr. Gupta has come up with Cardiac Risk Calculator that provides a risk estimate of perioperative myocardial infarction or cardiac arrest. Its predictive performance surpasses that of the RCRI. Patients who underwent surgery were identified from the American College of Surgeons' 2007 National Surgical Quality Improvement Program [NSQIP] database, a multicenter (250 hospitals) prospective database. Of the 211 410 patients, 1371 (0.65%) developed perioperative myocardial infarction or cardiac arrest. NSQIP database excluded trauma patients, transplant patients, and those younger than 16 years of age. The NSQIP database captures outcomes through 30 days after surgery. Out of 21 different types of (total 2114100) surgeries, 0.9% (1975) was urology (kidney and urinary system related surgeries [6]. The risk model based on the 2007 data set was subsequently validated on the 2008 data set (n257 385). The model performance was very similar between the 2007 and 2008 data sets, with C statistics or area under the receiver operating characteristic curve* of 0.884 and 0.874, respectively. Application of the RCRI to the 2008 NSQIP data set yielded a relatively lower C statistic (0.747). This risk model was used to develop an interactive risk calculator. * It is a tool for diagnostic test evaluation.

In Daniel Davenport study (2007), Cardiac Adverse Events (CAEs) occurred in 2,362 patients (1.29%) and of these, 59.44% expired. CAEs after non-cardiac operations are relatively infrequent but fetal. Operation type, urgency and American Society of Anesthesiologists physical status assessment are important independent predictors of cardiac morbidity [7].



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All the above mentioned studies did not include non cardiac surgeries carried out with patients suffering from Chronic Kidney Disease (CKD).

The prevalence of chronic kidney disease (CKD) has been increasing over the years and the presence of multiple risk factors predisposes this group of patients to premature cardiovascular mortality [8]. The United States Renal Data System (USRDS) 2014 annual report mentioned that the prevalence of any CVD is double in patients with CKD compared to non CKD (69.8% vs. 34.8%) [8]. CKD Patients with chronic kidney disease, irrespective of diagnosis, are at increased risk of cardiovascular disease (CVD), including coronary heart disease, cerebrovascular disease, peripheral vascular disease, and heart failure. Both "traditional" and "Non traditional" i.e. chronic kidney disease related" CVD risk factors may be contributing to this increased risk. According to NKF task force, all patients with chronic kidney disease should be considered in the "highest risk" group for cardiovascular disease, irrespective of levels of traditional CVD risk factors. Non-diabetic patients with chronic kidney disease have an increased prevalence of cardiovascular disease compared to the general population. NKF Task Force Report has highlighted the high prevalence of cardiovascular disease in dialysis patients. It has reported that Cardiovascular disease is the leading cause of death in non-diabetic patients with chronic kidney disease, regardless of stage of kidney disease. Cardiovascular disease mortality is more likely than development of kidney failure in non-diabetic patients with chronic kidney disease [9].

There is an urgent need to determine which preoperative factors might affect the development of cardiac complications after major non-cardiac operations among CKD patients.

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