Introduction
Children with congenital or acquired heart disease have an increased risk of anesthesia related morbidity and mortality. The severity and impact of each patient’s cardiac disease on their physiological status as well as comorbidities leads to varying degrees of anesthetic risk. The goal of this project was to develop a preoperative risk stratification method to define the anticipated anesthetic risk for pediatric patients with heart disease presenting for non-cardiac surgery.

Methods
The criteria developed assign children with heart disease into low, moderate, and high risk categories based on their cardiac disease, comorbidities, and planned surgical procedure. Simple lesions would fall into the low risk category whereas the children with more complex lesions, residual defects, or unrepaired lesions move the patient into a higher risk grouping (Table). Specific comorbidities such as dialysis dependence and surgical procedures that cause hemodynamic instability or large fluid shifts such as posterior spinal fusion were defined to also increase the anticipated risk level. High risk children are assigned to anesthesiologists with additional experience or training in pediatric cardiac anesthesia. After implementing this staffing method, 100 sequential charts of patients with heart disease were retrospectively reviewed.

Results
25 of the children were classified as low risk, 64 patients were classified as moderate risk, and 11 of the patients were classified as high risk. The provider caring for the patient and recorded complications were noted. In the low and moderate risk cohort, anesthetic complications were noted for seven of the 89 (8%) children. These included postoperative strider (n=1), severe postoperative nausea and vomiting (n=1), emergence delirium (n=2), laryngospasm (n=1), and intraoperative endotracheal tube mucus plugging requiring tube exchange (n=1). One child had a brief period of ST wave changes that resolved quickly without any treatment. One child in the high risk group developed (9%) mucous plugging of the endotracheal tube requiring suctioning (n=1).

Discussion
In our cohort, the perioperative complications noted were similar between both risk groups and were comprised of complications that can commonly occur in any pediatric patient. The low rate of cardiac complications could be due to the overall low incidence of these complications even in those with high risk cardiac disease or it is possible that the small number of cardiac complications seen even in the high risk group is attributable to the anesthetic management individualized to a patient’s cardiac condition tailored by the pediatric cardiac anesthesiologist. The small number of patients makes it impossible though to discern any true conclusions. We found this risk stratification method an effective method to differentiate children into low, moderate and high risk categories for anesthesia planning and management.

Initial risk grouping | Examples of lesions
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Low risk | Repaired atrial or ventricular septal defect
| Mild regurgitation or stenosis of a single valve
Moderate risk | Simple unrepaired lesions such as ventricular septal defect
| Tetralogy of Fallot with full repair
| Single ventricle with Glenn or Fontan palliation
| Mild pulmonary hypertension
| Conduction abnormalities such as Wolff Parkinson White, long QT syndrome, or pacemaker dependence
| Heart or lung transplant
High risk | Unrepaired complex cardiac lesions
| Systemic arterial to pulmonary arterial shunt
| High risk pulmonary hypertension
| Severe heart failure
| Severe valvular disease
| Ventricular assist devices
| Williams syndrome

References