Validation of the NSQIP Pediatric Surgery Risk Assessment Calculator with Surgical Outcomes for a Rural Population

Garrett A. Berk, MD Candidate[1]; Lauren E. Geisel, MD[2]; William D. Irish, PhD[1]; Leslie Hopper, MD[3]; Lauraine E. Etheridge, BSN, QNS II[4]; Elaine Henry, MSN, RNC-NIC[4]; Shannon W. Longshore, MD[1,4]; David A. Rodeberg, MD[1,4]; Danielle S. Walsh, MD[1,4]

[1]Brody School of Medicine; [2]Orlando Health; [3]UC Davis Medical Center; [4]Vidant Medical Center

BACKGROUND

Predicting which patients are more likely to have a postoperative surgical complication permits more accurate preoperative preparation, informs a more detailed consent process, and allows for improved shared decision making. The National Surgical Quality Improvement Program (NSQIP) Pediatric Surgical Risk Calculator (PSRC) was introduced 4 years ago and utilizes 17 patient predictors in conjunction with the planned procedure to estimate the patient-specific likelihood of post-operative complications within 30 days. Data from 67 hospitals nationwide were used in the algorithm's creation, many of which are situated in urban environments.

PROJECT AIM

To assess the accuracy of a risk calculator developed from a nationwide database in predicting complications in pediatric surgical patients in Eastern North Carolina.

PROJECT DESIGN/STRATEGY

Medical records from Vidant Medical Center were queried for patients fitting the Pediatric NSQIP inclusion criteria from 2015-2018 (N= 2,650). Risk Calculator variables, procedure CPT codes, and post-operative complications within 30 days were collected and entered into the PSRC. The resulting predictions were compared with the actual postoperative outcomes. Receiver operator characteristics (ROC) analysis was used to estimate the predictive ability of the Risk Calculator as estimated by area under the curve (AUC).

RESULTS/OUTCOMES

Predictive values for each of 9 outcomes estimated by the PSRC are provided in Table 1. Using the standard definitions of AUC, an AUC of 0.9-1.0 is considered "Excellent" predictive value, 0.8-0.9 is "Good," 0.7-0.8 is "Fair," 0.6-0.7 is "Poor," and <0.6 indicates no predictive value. When evaluating the PSRC for all patients, outcome prediction was Excellent for 4 outcomes, Good for 2 outcomes, and Fair for 3 outcomes. No outcome predictions rated as poor or failed. It was most accurate at predicting renal failure and least predictive for unplanned intubation. The actual incidence of complications by category is shown in Table 2.

Table 1: Predictive ability as estimated by AUC

	Complication								
	Any Complication (95% CI)	**Pneumonia (95% CI)**	**Cardiac Arrest (95% CI)**	**SSI (95% CI)**	**UTI (95% CI)**	**VTE (95% CI)**	**Renal Failure (95% CI)**	**Unplanned Reintubation (95% CI)**	**Death (95% CI)**
All	0.818 (0.786-0.849) **Good**	0.908 (0.829-0.987) **Excellent**	0.884 (0.740-1.0) **Good**	0.799 (0.749-0.848) **Fair**	0.788 (0.662-0.912) **Fair**	0.961 (0.932-0.990) **Excellent**	0.988 (0.981-0.995) **Excellent**	0.703 (0.598-0.807) **Fair**	0.933 (0.860-1.0) **Excellent**

Table 2: Actual incidence of complications

	Complication								
	Any Complication	**Pneumonia**	**Cardiac Arrest**	**SSI**	**UTI**	**VTE**	**Renal Failure**	**Unplanned Reintubation**	**Death**
All (n=2650)	209 (7.89%)	19 (0.72%)	8 (0.30%)	86 (3.25%)	10 (0.38%)	3 (0.11%)	3 (0.11%)	33 (1.25%)	17 (0.64%)

LESSONS LEARNED

Overall, the PSRC is valid for application to a more rural patient population, particularly with respect to prediction of mortality. This tool can be reliably utilized preoperatively for family counseling regarding operative risks for pediatric patients in various settings.

NEXT STEPS

The PSRC is not currently available within the Epic Electronic Health Record system; however, the findings from this project have prompted a quality project to incorporate its use into surgical pre-op notes and allow for better shared decision making between surgeons and patients. An additional project is underway to examine racial disparities in surgical outcomes.

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Garrett Berk, MD Candidate
Brody School of Medicine
Greenville, North Carolina 27858
252.744.1020
berkg18@students.ecu.edu