CE 1.5 Contact Hours

Patient Characteristics and Prevalence of Unplanned Postoperative Pediatric Intensive Care Unit Admissions

Amy McHenry, DNP, CPNP, Michael Forbes, MD, FCCM, and Mira Brown, MS, GStat

Objectives: The aim of this study was to identify the prevalence of unplanned postoperative pediatric intensive care unit (PICU) admissions (UPPAs) and associated patient characteristics.
Design: A retrospective, descriptive study at a single institution was conducted from January 1, 2011, to December 31, 2014. Trauma, medical, and weekend admissions were excluded. In addition, cardiac, orthopedic, and urology surgical admissions were excluded. A derived disability level was calculated using the baseline Pediatric Overall and Cognitive Performance Criteria. Mortality risk and acuity scores were compared between UPPAs and planned PICU admissions (PPAs). Outcomes as a function of patient origin (operating room [OR], postanesthesia care unit [PACU], and acute care floor [ACF]) and surgical services were compared.
Setting: This study was conducted in a free-standing, tertiary care children's hospital.
Patients: Patients admitted to the PICU within 24 hours following an operative procedure.
Measurements and Main Results: There were 158 (34%) UPPAs. Compared with postoperative PPAs, UPPAs had higher acuity and mortality scores ($p < .05$). UPPAs were highest from the OR (58%), followed by those from the PACU (PACU-UPPA, 27%) and ACF (13%). There was no difference in the odds of UPPAs from the OR among surgical services. There was increased odds of PACU-UPPA after otolaryngology (odds ratio = 1.15, $p < .0001$) and pediatric surgery (odds ratio = 2.19, $p < .0001$) and the presence of disability (odds ratio = 3.67, $p = .011$). None of the variables were associated with UPPAs from the ACF.
Conclusions: This study identified surgical services and moderate disability as independent risk factors for UPPA. PACU-UPPA may represent an improvement opportunity. It is feasible to derive a risk stratification model for UPPA.

KEY WORDS: patient disposition, postoperative, unplanned admissions

Amy McHenry, DNP, CPNP
Critical Care Nurse Practitioner, Pediatric Surgery, Akron Children's Hospital, OH.
Michael Forbes, MD, FCCM
Intensivist, Akron Children's Hospital, OH.
Mira Brown, MS, GStat
Statistician, Akron Children's Hospital, OH.
Correspondence: Akron Children's Hospital One Perkins Square Akron, OH 44308.
E-mail: amchenry@chmca.org
The authors have declared no conflict of interest.
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INTRODUCTION

In 1999, the Institute of Medicine (IOM) Committee on Quality Health Care in America released *To Err is Human: Building a Safer Health System*. The report estimated that 98,000 hospitalized patients die each year because of preventable medical errors (IOM, 1999). The report was a scathing indictment of the state of American healthcare and a clarion call to address severe gaps in quality and patient safety. Patient death and injury were not a function of healthcare professionals' competence, good intentions, or hard work but rather a function of the system of care. The committee called for the redesign of system processes to prevent, recognize, and quickly recover from errors to minimize patient harm (Homsted, 2000). In addition, the committee recognized that the climate surrounding errors needed to change. Instead of blaming individuals—the prevailing default—healthcare systems should view errors as system failures while removing reckless individuals from the system. Errors should be reported and analyzed to improve system processes and eliminate preventable errors. The IOM called for redesigned healthcare processes to safeguard patients from death and injury.

Two years later, the Committee released *Crossing the Quality Chasm: A New Health System for the 21st Century*. This report provided guidance of how healthcare systems should emphasize quality care and foster innovation (IOM, 2001). The Committee recognized that sweeping changes to the healthcare system came with challenges. To make change possible, healthcare systems needed to improve care processes, utilize information technologies effectively, foster and leverage the knowledge and skills of clinicians, build and develop effective care teams, and coordinate care across patient conditions, services, and sites over time (Pedreira, 2011). To address these challenges, the Committee outlined six aims for improvement that would

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ensure a safer healthcare system. The aims were based on the core need of healthcare to be safe, effective, patient centered, timely, efficient, and equitable (Lee, 2006). Healthcare systems able to achieve major gains in the six areas would better meet patient needs. Clinicians would also benefit and have greater professional satisfaction and productivity as interventions become more efficient and effective. The IOM provided a broad roadmap for healthcare organizations to promote higher-quality and safer patient care. However, before processes can be improved, the current state must be analyzed. This study examined the current state of our postoperative process to identify opportunities for anticipating patient needs and eliminating waste.

Clinical decision-making for perioperative pediatric care begins with the preoperative history and physical examination. Careful attention must be paid to evaluate patients for acute issues that warrant postponement of the operation or chronic concerns that may affect recovery. A complete and accurate history in the context of the proposed operation helps determine postoperative disposition. Reassessment is expected on the day of surgery.

Next, ongoing intraoperative assessment may affect disposition. In the current perioperative workflow, patients not expected to require pediatric intensive care unit (PICU) admission are admitted to the postanesthesia care unit (PACU). Planned PICU admissions (PPAs) bypass the PACU. Those who remain in the PACU are reevaluated to ensure safe transfer to the acute care floor (ACF).

Suboptimal clinical decision-making has immediate consequences for patients and the system of care: (a) Inadequate postoperative monitoring and evaluation results in unrecognized/undertreated clinical decompensation that may lead to morbidity or mortality, and (b) a mismatch between nursing and other provider staffing occurs as clinical decompensation creates preventable, unplanned high acuity for the PICU and excess staffing on the ACF that is avoidable. For instance, if a patient is scheduled for an operation followed by PACU and ACF admission, resources are allocated to those areas. However, if the patient decompensates and requires PICU admission, rapid resource reallocation and mobilization are required. The patient and family are also affected. Before operative procedures, the most likely clinical course is communicated, which includes postoperative disposition. Patient and family distress and dissatisfaction may result when there is deviation from the expected. Unplanned PICU admissions (UPPAs) are disruptive to the system and threaten safe, timely, effective, efficient, and patient-centered care because of misallocation of resources and unfulfilled family expectations.

Variation in the literature regarding the incidence of UPPA is due to dissimilar study definitions, design, and institutional processes. Furthermore, a review of the nursing literature resulted in no studies addressing patterns and risk factors for UPPA. UPPA rates have been described from 0.14% (Kurowski & Sims, 2007) to 16.7% (Osinaike & Adeninto, 2010) of all surgical procedures. However, evidence suggests that there are identifiable preoperative and intraoperative risk factors related to unplanned operating room (OR) to PICU admissions (OR-UPPA). Patients undergoing emergent/urgent operations, those with preexisting comorbidities and/or upper airway abnormalities (Gibson, Limb, & Bell, 2014), and children < 5 years old (Kurowski & Sims, 2007) have higher UPPA risk. Intraoperative events such as hypoxia (da Silva, de Aguiar, & Fonseca, 2013) and neurologic or hemodynamic compromise (Haller et al., 2005) also increase the risk of OR-UPPA. In addition, patients having ear, nose, throat, palate (Kurowski & Sims, 2007), or abdominal (da Silva et al., 2013) operations are also at an increased risk.

Studies also suggest that patients' admission origin affects risk of mortality and PICU length of stay. Odetola et al. (2008) reported that patients admitted from ACFs had a significantly higher mortality rates when compared with those admitted from emergency department, OR, and interhospital areas. However, El Halal, Barbieri, Filho, Trotta Ede, and Carvalho (2012) found that mortality was twice as high in patients with comorbidities, regardless of patient origin. There is evidence that both patient origin and comorbidities affect clinical course, but their differential impact remains incompletely understood.

Incidence rates and intraoperative risk factors related to immediate admission to the PICU after surgical interventions have been studied. These data provide OR staff guidance regarding patients who may require PPA. However, there is a paucity of evidence-based guidance regarding pediatric perioperative disposition.

This study examines the current process of pediatric perioperative disposition. The purpose was to describe the prevalence of UPPA and associated patient characteristics. As a program of research, these findings will inform the development of a pediatric perioperative risk stratification model, designed to eliminate preventable UPPA.

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Theoretical Framework

The theoretical construct for this study is diffusion of responsibility. Diffusion of responsibility occurs in group settings where an individual's willingness to intervene is inhibited by the presence of others, assuming they will intervene (Tiegen & Brun, 2011). Groups take more risks than individuals (Wallach, Kogan, & Bem, 1962), and individuals are more likely than groups to come to the aid of a person in distress (Darley & Latané, 1968). In hierarchical groups, individuals look to the highest ranking member for direction, hesitate to disrupt the hierarchy, and refrain from taking action. This can become problematic as subordinates claim they are following orders whereas leaders claim that their responsibility is to give orders or directives and not perform the actions under question. In these situations, responsibility is diffused among group members (Leary & Forsyth, 1987), resulting in no action.

It is often the responsibility of many healthcare providers to care for a patient in clinical settings. Individuals who have clearly defined responsibilities are more likely to voice concerns and attend to changing patient conditions (Harkins & Jackson, 2014). Unfortunately, individuals' roles and responsibilities are frequently assumed, rather than clearly stated, in the absence of standardized procedures (Henriksen & Dayton, 2006). Although other lapses may exist, the absence of standardized procedures often occurs when patients transition from one locus of care to another and where standardized procedures could be helpful. Without standardized procedures during transitions, changing patient clinical status can be missed or not addressed as responsibility is diffused among multiple teams and caregivers.

In this study population, transition through the care continuum has many clinical milestones. Studying the perioperative process will inform strategies and tactics that diminish diffusion of responsibility. By identifying areas where diffusion may exist, alternative steps can be taken to ensure perioperative care is safe, effective, patient centered, timely, and efficient.

We hypothesize there is a variable risk of unexpected perioperative deterioration as a function of (a) age, (b) underlying health status, (c) preoperative functional status, and (d) type of surgical intervention. The research aims are:

1. to describe the overall prevalence of UPPA as a function of surgical service;
2. to validate published patient characteristics associated with the likelihood of UPPA; and
3. to discern whether the severity of illness scores for patients with UPPAs is different from patients with PPAs.

MATERIALS AND METHODS

In a free-standing, tertiary care children's hospital located in northeast Ohio, PICU admissions from January 2011 to December 2014 were identified using the Virtual PICU Systems (VPS, LLC; http://www.myvps.org/) database. This international PICU clinical database has been well described elsewhere (National Institutes of Health, 2002). All patients admitted to the PICU within 24 hours after operation were included. Trauma patients, medical ICU patients, weekend admissions, and those with operations after PICU admission or more than 24 hours before admission were excluded. Unplanned admissions were defined by the VPS definition: arrival with less than 12-hour prior notice.

Patients were categorized by surgical service and patient origin. Surgical services included general surgery (PEDSURG), neurosurgery (NSURG), otolaryngology (ENT), heart center (cardiothoracic surgery/cardiology), orthopedic surgery, plastic surgery (PLASTICS), and urology. For COMPLEX surgical cases (more than one surgical department), attribution was limited to one procedure per surgeon per admission. Patient origin included the OR, PACU, and ACF, as shown in Figure 1.

The following characteristics were collected: age (in months); Pediatric Index of Mortality, Version 2 (PIM-2); pediatric logistic organ dysfunction (PELOD); Pediatric Risk of Mortality, Version III (PRISM-III); and Pediatric Cognitive Performance Criterion (PCPC) and Pediatric Overall Performance Criterion (POPC). PIM-2 (Figure 2) predicts mortality as a function of the first PICU hour vital signs and laboratory values. Validity and reliability have been established internationally

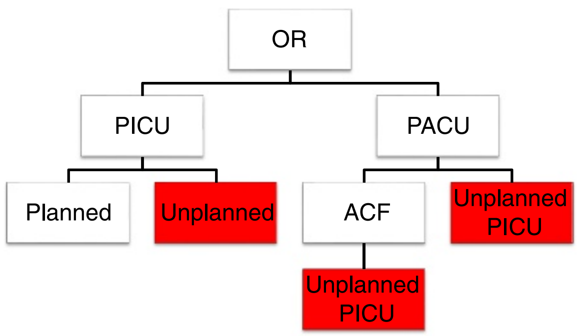

FIGURE 1. Schematic illustration of patient disposition after surgical intervention. The red boxes indicate the patients of interest in the study. PICU = pediatric intensive care unit; PACU = postanesthesia care unit; OR = operating room; ACF = acute care floor; PPA = planned PICU admission; UPPA = unplanned PICU admission.

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Elective Admission? ○ *Yes* ○ *No*

Recovery Post-Procedure? ○ *Yes* ○ *No*

Cardiac Bypass? ○ *Yes* ○ *No*

Diagnosis Risk ○ *High* ○ *Low* ○ *Neither*

Lack of pupillary response (> 3 mm and both fixed) ○ *Yes* ○ *No/Unknown*

Mechanical Ventilation? ○ *Yes* ○ *No/Unknown*

First Systolic Blood Pressure [ ] *mmHg*

Base Excess (arterial or capillary blood) [ ] *mEq/L or mmol/L*

FiO_2 during first ABG [ ] *% O2*

P_aO_2 during first ABG [ ] *mmHg*

Risk of Mortality

Risk of mortality = e ^ (PIM2 score) / [1 + e ^ (PIM2 score)]

PIM2 score = -0.9282(Elective) - 1.0244(Recovery) + 0.7507(Bypass) + 1.6829(High-Risk) - 1.577(Low-Risk) + 3.0791(Pupils) + 1.3352(Ventilator) + 0.01395(absolute value of SBP-120) + 0.1040(absolute value of base excess) + 0.2888(100 x FiO_2 / P_aO_2) - 4.8841

https://www.openpediatrics.org/assets/calculator/pediatric-index-mortality-2

FIGURE 2. Pediatric Index of Mortality, Version 2 (PIM-2) scoring tool.

(Gandhi, Sangareddi, Varadarajan, & Suresh, 2013). PELOD (Figure 3) describes the severity of organ dysfunction in critically ill pediatric patients. International reliability and validity have been established (Leteurtre et al., 2003). The PRISM-III (Figure 4) score is used to predict mortality based on the first 24 hours of PICU admission. It includes 17 physiologic variables subdivided into 26 ranges. This tool has been validated and has excellent discrimination and accuracy (Pollack, Patel, & Ruttimann, 1996). PCPC and POPC (Figure 5) are functional status scores that quantify the level of disability of pediatric patients, scored on every PICU admission. Both scores range from 1 ("normal") to 5 ("profound disability"). The PCPC and POPC scores were transformed and used to derive the VPS disability score (VPSDis). If the sum of the scores was >3, the patient was identified as having more than a mild disability.

Statistical Analysis

Descriptive statistics were calculated on patient parameters. Parameters that failed normality testing were analyzed using Mann–Whitney *U* test, and medians were reported (95% CI). Bivariate analyses incorporating patient characteristics and surgical department were used to identify independent variables driving UPPAs from the OR, PACU, and ACF. Multivariate logistic regression incorporating surgical department as well as

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Organ Dysfunctions and Variables	Points by Severity Levels 0	1	2	3	4	5	6
Neurologic							
Glasgow Coma Score	≥ 11	5-10			3-4		
Pupillary reaction	Both Reactive					Both Fixed	
Cardiovascular							
Lactatemia (mmol/L)	<5.0	5.0-10.9			≥11.0		
Mean arterial pressure (mm Hg)							
0 to < 1 mo	≥ 46		31-45	17-30			≤ 16
1-11 mo	≥ 55		39-54	25-38			≤ 24
12-23 mo	≥ 60		44-59	31-43			≤ 30
24-59 mo	≥ 62		46-61	32-44			≤ 31
60-143 mo	≥ 65		49-64	36-48			≤ 35
≥ 144 mo	≥ 67		52-66	38-51			≤ 37
Renal							
Creatinine (mol/L)							
0 to < 1 mo	≤ 69		≥ 70				
1-11 mo	≤ 22		≥ 23				
12-23 mo	≤ 34		≥ 35				
24-59 mo	≤ 50		≥ 51				
60-143 mo	≤ 58		≥59				
≥ 144 mo	≤ 92		≥ 93				
Respiratory							
PaO_2 (mmHg)/FiO_2	≥ 61		≥ 60				
$PaCO_2$ (mmHg)	≤ 58	59-94		≥ 95			
Invasive ventilation	No			Yes			
Hematologic							
WBC count (X 10^9/L)	>2		≤ 2				
Platelets (X 10^9/L)	≤ 142	77-141	≤ 76				

FIGURE 3. Pediatric Logistic Organ Dysfunction (PELOD-2) scoring tool. PELOD-2 quantifies severity of illness as a function of multiple organ dysfunction. Data based on information from Tatic, M., Gvozdenovic, L., Maskovic, S., & Vojnovic, M. (2014).

patient age and level of disability (patient factors) was used to identify drivers of UPPA by patient origin. Variables with $p < .10$ were incorporated into the multivariate logistic regression. Significance was defined as $p < .05$. Statistical analysis was performed using Medcalc software (MedCalc Version 16.4.3, http://www.medcalc.org).

RESULTS

There were 6,452 PICU admissions during the study period, and 460 met the study criteria and accounted for 498 unique procedures. Urology was excluded from the analysis because of low volumes (n = 3). In addition, the heart center and orthopedic surgery were excluded as >95% of their cases were PPAs. Of the 498 remaining procedures, most were performed by NSURG (n = 140, 28%) and PLASTICS (n = 138, 28%) each, followed by PEDSURG (n = 119, 24%) and ENT (n = 101, 20%), as shown in Figure 6. Thirty-four percent of the procedures resulted in UPPAs (n = 171). UPPAs had higher severity of illness and mortality risk scores than PPAs ($p < .05$), as shown in Table 1.

Kruskal–Wallis test was utilized to examine the difference between PRISM-IIII and PIM-2 scores based on patient origin. Results showed statistically significant differences (Table 2). Of note, PIM-2 scores were highest in ACF-UPPA (0.76, range = 0.32–1.01, $p < .0001$).

UPPA by Patient Origin and by Department and Risk Factors

Most (58%) UPPAs are OR-UPPA, with PACU-UPPA and ACF-UPPA accounting for 27% and 13%, respectively. UPPA rates ranged from 20.6% (COMPLEX) to 43% (PLASTICS). These data were further analyzed to

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Variable	Infants (Age Restrictions & Ranges)	All Ages (Age Restrictions & Ranges)	Children (Age Restrictions & Ranges)	Score
Systolic BP,	130-160		150-200	2
mm Hg	55-65		65-75	
	>160		>200	6
	40-54		50-64	
	<40		<50	7
Diastolic BP,		>110		
mm Hg				
Heart rate,	>160		>150	4
beats/min	<90		<80	
Respiratory rate,	61-90		51-70	1
breaths/min	>90		>70	5
	Apnea		Apnea	
$PaCO_2/FiO_2$		200-300		2
		<200		3
$PaCO_2$		51-65		1
		>65		5
Glasgow Coma Score		<8		6
Pupillary reactions		Unequal or dilated		4
		Fixed and dilated		10
PT/PTT		1.5 X control		2
Total bilirubin		Age > 1 mo		6
umol/L (mg/dL)		>60 (>3.5)		
Potassium, mmol/L		3.0-3.5		1
		6.5-7.5		
		<3.0		5
		>7.5		
Calcium		1.75-2.00 (7.0-8.0)		2
mmol/L (mg/dL)		2.99-56.14 (12.0-15.0)		
		<1.75 (<7.0)		6
		<56.14 (<15.0)		
Glucose		2.2-3.3 (40-60)		4
mmol/L (mg/dL)		13.9-22.2 (250-400)		
		<2.2 (<40)		8
		>22.2 (>400)		
Bicarbonate, mEq/L		<16		3
		>32		

FIGURE 4. PRISM-III scoring tool. Data based on information from Tatic, M., Gvozdenovic, L., Maskovic, S., & Vojnovic, M. (2014).

delineate patient origin by department (Figure 6). The PACU-UPPA model retained all surgical departments and VPSDis as independent factors. ENT (odds ratio = 1.15, $p < .0001$), PEDSURG (odds ratio = 2.19, $p < .0001$), and VPSDis (odds ratio = 3.67, $p = .011$) all increased the odds of PACU-UPPA, whereas COMPLEX, NSURG, and PLASTICS were independent protective factors (odds ratios = 0.55, 0.25, and 0.17, respectively; $p < .0001$). No variables were associated with ACF-UPPA.

DISCUSSION

This study described the prevalence of UPPA in a single free-standing children's hospital. One in three surgical PICU admissions represented a UPPA event, and differences between surgical departments in the UPPA rates exist. Age was not an independent risk factor for a UPPA event, whereas VPSDis was a risk factor for PACU-UPPA. Because 95% (20/21) of ACF admissions were UPPAs, no comparisons among surgical departments were possible. Finally, there were 10- and 3-fold higher PELOD and PIM-2 scores in UPPAs when compared with PPAs. Mortality was not studied.

The process for determining postoperative disposition is complex, and most patients matriculate through the continuum of care in a safe, timely, and efficient manner. In this study, one of three had a UPPA. Postoperative disposition represents the complex interplay between the preoperative, intraoperative, and immediate postoperative assessments. Surgeon affects assessment at all three decision nodes. In general, patient history and clinical characteristics, intraoperative events and shared decision-making with anesthesiologists, and postoperative assessment are all opportunities to course correct and ensure patient safety. Whereas overtriage to critical care is inefficient, undertriage to acute care can have life-threatening consequences. There is an urgent need to optimize both.

Although it may be impossible to reduce the rate of UPPAs to zero, opportunities to improve the process remain. This study shows that risk factors exist and a risk stratification tool would be helpful to enhance patient safety and satisfaction.

Study Limitations

Beyond the inherent limitations of the retrospective analysis, four additional caveats are worth discussing. First, the incidence of UPPA was not measured in this study. The odds of a UPPA were based on PICU admission volumes by surgical service. As PEDSURG accounts for almost 50% of postoperative PICU admissions, their UPPA events may be overrepresented. Representation bias was minimized by excluding weekend and trauma admissions. Bias was further controlled by excluding surgical services where PPAs were over 95%. Additional data regarding total cases per surgical department are needed to calculate UPPA rates by service and surgical procedure. Determining UPPA rate will require auditing and compiling every surgical procedure performed that led to an overnight hospitalization, which is deeply embedded in the electronic health record. Once rates are known, department- and procedure-specific interventions can be tested.

Second, unscheduled admissions in this study may also be erroneously elevated because of definitions and operational, technical, and scheduling difficulties. The definition of unplanned (<12-hour notice) admission is debatable.

Third, surgical department designation may obscure the role of specific high-risk procedures, independent of department. We attempted to control this bias by combining multisurgeon procedures into a separate department category (COMPLEX) and analyzed those admissions separately.

Fourth, there are numerous high-risk comorbid conditions that were unaccounted for in the analysis. These include morbid obesity, tracheobronchomalacia,

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Pediatric Cognitive Performance Criterion (PCPC)

Score	Category	Description
1	*Normal*	Normal, at age-appropriate level; school-age child attending regular school classroom.
2	*Mild Disability*	Conscious, alert, and able to interact at age-appropriate level; school-age child attending regular school classroom but grade perhaps not appropriate for age; possibility of mild neurological deficit.
3	*Moderate Disability*	Conscious; sufficient cerebral function for age-appropriate independent activities of daily life; school-age child attending special education classroom and/or learning deficit present.
4	*Severe Disability*	Conscious; dependent on others for daily support because of impaired brain function.
5	*Coma or Vegetative State*	Any degree of coma without the presence of all brain death criteria; unawareness, even if awake in appearance, without interaction with environment; cerebral unresponsiveness; and no evidence of cortex function (not aroused by verbal stimuli); possibility of some reflexive response, spontaneous eye-opening, and sleep-wake cycles.

Pediatric Overall Performance Criterion (POPC)

Score	Category	Description
1	*Good Overall Performance*	Healthy, alert, and capable of normal activities of daily life.
2	*Mild Overall Disability*	Possibility of minor physical problem that is still compatible with normal life; conscious and able to function independently.
3	*Moderate Overall Disability*	Possibility of moderate disability from non-cerebral systems dysfunction alone or with cerebral system dysfunction; conscious and performs independent activities of daily life but is disabled for competitive performance in school.
4	*Severe Overall Disability*	Possibility of severe disability from non-cerebral systems dysfunction alone or with cerebral system dysfunction; conscious but dependent on others for activities of daily living support.
5	*Coma or Vegetative State*	

FIGURE 5. Pediatric Cognitive Performance Criterion.

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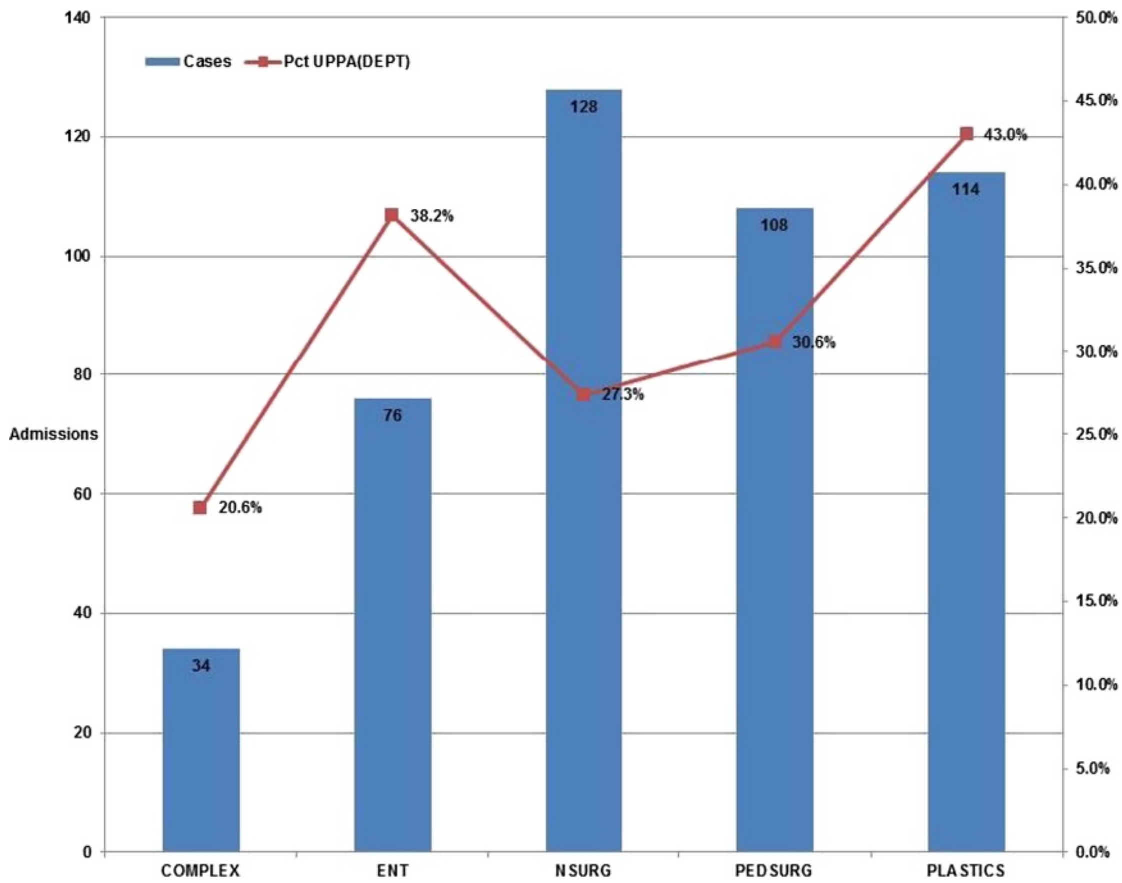

Complex = multiple surgical services, ENT= Otolaryngology, NSURG = Neurosurgery, PEDSURG=General Surgery, PLASTICS=Plastic surgery

FIGURE 6. Number of cases and percentage of unplanned postoperative PICU admission (UPPA) by surgical department.

Table 1: Severity of Illness and Mortality Risk between Planned (PPA) and Unplanned Postoperative PICU Admissions (UPPA)

Severity of Illness					
	Cases	Median	IQR (25%–75%)	95% CI	*p*
PELOD					
PPA	302	1	0–10	0–10	<.0l
UPPA	158	10	0–11	2–10	
PIM-2, risk of mortality					
PPA	302	0.14	0.12–0.17	0.13–0.15	<.01
UPPA	158	0.40	0.17–1.10	0.33–0.52	
PRISM-III					
PPA	302	0	0–2	0–0	.04
UPPA	158	0	0–4	0–0	

PELOD = Pediatric Logistic Organ Dysfunction; PIM-2 = Pediatric Index of Mortality, Version 2; PRISM-III = Pediatric Risk of Mortality, Version 3.

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Table 2: Comparison of Severity of Illness and Mortality Risk by Patient Origin							
	n	Minimum	25th Percentile	Median	75th Percentile	Maximum	*p* Value
PELOD							
ACF	21	0	0	2	10	42	.12
OR	333	0	0	2	10	51	
Other	6	0	10	11	12	12	
PACU	100	0	0	1	10	12	
PIM-2							
ACF	21	0.28	0.32	0.76	1.01	13.89	<.01
OR	333	0.03	0.12	0.15	0.43	40.47	
Other	6	0.11	0.16	0.23	0.34	18.4	
PACU	100	0.11	0.13	0.16	0.38	4.78	
PRISM-III							
ACF	21	0	0	0	3	11	.01
OR	333	0	0	0	3	18	
Other	6	0	0	0	0	0	
PACU	100	0	0	0	2	7	

ACF = acute care floor; OR = operating room; PACU = postanesthesia care unit; PELOD = Pediatric Logistic Organ Dysfunction; PIM-2 = Pediatric Index of Mortality, Version 2; PRISM-III = Pediatric Risk of Mortality, Version 3.

and asthma. Although each confers an additional perioperative risk, these were not specifically addressed. Finally, a single database was used to derive this feasibility model. Multiple administrative and clinical databases will be necessary to better identify UPPA rates, types, and outcomes. Each database has unique strengths and weaknesses, and combining databases facilitates synergy and more robust analyses.

Conclusion

This study identified the role of specific surgical services and the presence of moderate disability as independent risk factors for unplanned surgical admissions to the PICU. An attempt to quantify the relationship between common severity of illness scores and the risk of an unplanned admission was made resulting in the finding that UPPAs have higher PELOD and PIM-2 scores. This study shows feasibility of deriving a model of UPPA risk based on surgical department and patient characteristics.

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