Implementing a Pediatric Perioperative Surgical Home Integrated Care Coordination Pathway for Laryngeal Cleft Repair

Izabela Leahy, MS,*† Connor Johnson, BS,* Steven J. Staffa, MS,* Reza Rahbar, MD, DMD,†‡ and Lynne R. Ferrari, MD*†

BACKGROUND: The Pediatric Perioperative Surgical Home (PPSH) model is an integrative care model designed to provide better patient care and value by shifting focus from the patient encounter level to the overarching surgical episode of care. So far, no PPSH model has targeted a complex airway disorder. It was hypothesized that the development of a PPSH for laryngeal cleft repair would reduce the high rates of postoperative resource utilization observed in this population.

METHODS: Institutional review board approval was obtained for the purpose of data collection and analysis. A multidisciplinary team of anesthesiologists, surgeons, nursing staff, information technology specialists, and finance administrators was gathered during the PPSH development phase. Standardized perioperative (preoperative, intraoperative, and postoperative) protocols were developed, with a focus on preoperative risk stratification. Patients presenting before surgery with ≥1 predefined medical comorbidity were triaged to the intensive care unit (ICU) postoperatively, while patients without severe systemic disease were triaged to a lower-acuity floor for overnight observation. The success of the PPSH protocol was defined by quality outcome and value measurements.

RESULTS: The PPSH initiative included 120 patients, and the pre-PPSH period included 115 patients who underwent laryngeal cleft repair before implementation of the new process. Patients in the pre-PPSH period were reviewed and classified as ICU candidates or lower acuity floor candidates had they presented in the post-PPSH period. Among the 79 patients in the pre-PPSH period who were identified as candidates for the lower-acuity floor transfer, 70 patients (89%) were transferred to the ICU (P < .001). Retrospective analysis concluded that 143 ICU bedded days could have been avoided in the pre-PPSH group by using PPSH risk stratification.

Surgery duration (P = .034) and hospital length of stay (P = .015) were found to be slightly longer in the group of pre-PPSH observation unit candidates. Rates of 30-day unplanned readmissions to the hospital were not associated with the new PPSH initiative (P = .093). No patients in either group experienced emergent postoperative intubation or other expected complications. Total hospital costs were not lower for PPSH observation unit patients as compared to pre-PPSH observation unit candidates (difference = 8%; 95% confidence interval, −7% to 23%).

CONCLUSIONS: A well-defined preoperative screening protocol for patients undergoing laryngeal cleft repair can reduce postoperative ICU utilization without affecting patient safety. Further research is needed to see if these findings are applicable to other complex airway surgeries.

KEY POINTS

- **Question:** What is the value added of the Perioperative Surgical Home model in pediatric surgical patients undergoing complex airway surgery?
- **Findings:** By using a Pediatric Perioperative Surgical Home risk stratification process, the use of high-cost intensive care resources may be modified.
- **Meaning:** A well-defined preoperative screening protocol for patients undergoing laryngeal cleft repair can reduce postoperative intensive care unit utilization without affecting patient safety.

P

Reoperative triage, evaluation, and planning are coordinated care activities involving multiple providers, many of whom may not be fully involved in all components of the episode of care. The Perioperative Surgical Home (PSH) is a patient-centered, innovative model of delivering health care during the entire patient surgical/procedural experience, from the decision for surgery through the recovery phase, including postacute care disposition. The implementation of a PSH model has proven to be successful at conserving hospital resources, as well as reducing cost and length of stay in many surgical populations. Through standardization, the PSH model emphasizes proactive and collaborative evidence-informed decision-making throughout the entire perioperative episode of care.

At Boston Children’s Hospital, a Pediatric PSH (PPSH) was developed for patients with a diagnosis of laryngeal cleft undergoing endoscopic surgical repair. Although several PSH initiatives have been tested in pediatric populations, this is the first PPSH targeting a complex airway surgical procedure. Laryngeal cleft is a rare congenital disorder.
abnormality resulting in failure of fusion of the interarytenoid region of the larynx. The prevalence of laryngeal cleft is reported to be 1 in 10,000 to 1 in 20,000 live births. It was hypothesized that determination of postoperative intensive care unit (ICU) disposition guided by preoperative risk stratification based on medical comorbidities would reduce the unnecessary utilization of high-cost resources and potentially reduce the overall cost of the perioperative episode of care. The goals of this article are to describe the design and implementation of the laryngeal cleft PPSH at Boston Children’s Hospital and to report the impact of this program over a 24-month period.

METHODS
Boston Children’s Hospital Institutional Review Board approval was obtained with a waiver of consent. Data described in this analysis were obtained using an innovative institutional review board–approved PPSH dashboard. The dashboard utilizes real-time tracking of postprocedure department transfers, readmissions, complications, and cost, which aggregates and displays clinical and billing data based on a discrete surgical procedure. The analysis included 235 patients who underwent endoscopic laryngeal cleft repair utilizing the carbon dioxide laser. Patients who presented with comorbid esophageal atresia were not included in the PPSH due to significant differences in surgical management compared to isolated laryngeal cleft repair. The laryngeal cleft repair PPSH was piloted during the last quarter of 2015, followed by full implementation in February 2016. Patients admitted for laryngeal cleft repair after February 1, 2016 were automatically enrolled in the PPSH program and labeled in the surgical scheduling application as “PPSH” patients. A total of 115 patients were included in the PPSH initiative, and 120 patients admitted in 2014 and 2015 before implementation of the PPSH process (pre-PPSH) were included as a reference group. No families refused participation in the PPSH initiative.

Planning and Development
The PPSH team used an interdisciplinary construct consisting of individuals directly and indirectly involved in the care system that supports the PPSH. This team included anesthesiologists, surgeons, nurses, quality improvement specialists, information technology personnel, and professionals from finance. The PPSH team met regularly during the design, development, and monitoring phase. Clinical workflow was described using a process mapping algorithm to describe patient work pre-, intra-, and postoperatively (Figure 1). Duplication of care and areas of high resource use were identified and redesigned through the PPSH integrative approach. Key caregivers for this patient population were brought together for clinical decision-making, input, and evaluation. The laryngeal cleft repair population was identified as having high ICU utilization because all patients were automatically admitted to the ICU postoperatively before the PPSH process implementation. Decreasing the high rate of ICU admission was determined to be a valuable institutional outcome. Assignment of postoperative disposition during the preoperative segment of the episode of care to non-ICUs based on clinical acuity and associated comorbidities was planned as process improvement (Table 1). The standard intraoperative technique consisted of total intravenous anesthesia, spontaneous ventilation with a natural airway during suspension laryngoscopy, and carbon dioxide laser ablation for surgical correction.

Measures
The measures used to evaluate the success of the PPSH protocol for laryngeal cleft repair were defined before the start of the intervention. The primary measure was the percentage of patients admitted to the ICU postoperatively. The secondary outcome measure was cost of care, which we expected to decrease as a result of avoiding the high facility costs associated with the ICU. Finally, the balance measures were the rate of complications defined as emergent postoperative intubation and readmission within 30 days postdischarge, which were used to evaluate the safety of the process change.

Risk Stratification and Postoperative Disposition
Patient complexity and presence of comorbidities were used to stratify the PPSH group into 2 patient populations. The high-acuity patients were triaged to ICU care postoperatively, whereas low-acuity patients were assigned to the observation unit after first-stage recovery.

• High-acuity population: These patients had significant medical comorbidities or craniofacial abnormalities that required a higher level of postoperative surveillance. Examples include tracheomalacia, previous tracheostomy, trisomy 21, chronic lung disease, and recurrent pneumonia.

• Low-acuity population: Patients who were otherwise healthy and did not have severe systemic disease or serious comorbid conditions.

Monitoring
The PPSH dashboard was used to monitor the process, outcome, and balance measures in real time allowing for rapid feedback regarding evidence-based improvements. The design and application of the PPSH dashboard, which is a computer application that queries, aggregates, and displays all relevant data from the hospital database regarding a defined procedure, has been described previously.

Analysis
All data were queried from the institutional data warehouse and organized into SPSS version 24 (IBM, Armonk, NY) and Stata version 13.1 (StataCorp, College Station, TX) for analysis. Normality was assessed for all variables by the Shapiro–Wilk test and histogram visualization. Continuous patient factors and outcomes are expressed as medians.
and interquartile ranges, and categorical patient factors and outcomes are presented as frequencies and percentages. Patients in the pre-PPSH group were retrospectively reviewed and evaluated to have been either ICU candidates or observation unit candidates. Comparisons between pre-PPSH observation unit candidates and post-PPSH observation unit patients were made using the Wilcoxon rank sum test for continuous variables and the Fisher exact test or the
RESULTS

All patients had the diagnosis of type 1, 2, or 3 laryngeal cleft, which was repaired endoscopically. The PPSH initiative included 120 patients, and the pre-PPSH period included 115 patients who underwent the same procedure before implementation of the new process. Baseline demographic data of all are included in Table 2. PPSH observation unit patients were found to be similar to pre-PPSH observation unit candidates in age (\( P = .999 \)), American Society of Anesthesiologists physical status (\( P = .209 \)), and number of preexisting complex chronic conditions (\( P = .661 \)), revealing comparability in the complexity of patients in these 2 groups.

Outcomes

Operative Outcomes. Both scheduled and unplanned admission to the ICU were tracked using the PPSH dashboard. Among the 79 patients in the pre-PPSH period who were identified as candidates for the observation unit, 70 patients (89%) were transferred to the ICU (\( P < .001 \); Figure 2). Retrospective analysis concluded that 143 ICU bedded days could have been avoided in the pre-PPSH group by using PPSH risk stratification. Operating room duration (\( P = .034 \)) and hospital length of stay (\( P = .015 \)) were found to be slightly longer in the group of pre-PPSH observation unit candidates (Table 2). Segmented regression analysis did not find a statistically significant reduction in the average ICU utilization rate from just before to just after implementation of the PPSH intervention (estimated change = −0.31; 95% CI, −0.71 to 0.09; \( P = .126 \)) nor a significant change in the slope (rate of change in ICU utilization; estimated change in slope after PPSH intervention = −0.002; 95% CI, −0.06 to 0.06; \( P = .956 \)). There was no significant change in mean length of stay from just before to just after implementation of the PPSH intervention (estimated change = 0.19; 95% CI, −0.46 to 0.84; \( P = .567 \)) nor a change in slope over time from before as compared to after the PPSH intervention (estimated change in slope after PPSH intervention = −0.06; 95% CI, −0.18 to 0.07; \( P = .384 \); Figure 3).

Safety Outcomes. Increased rates of 30-day unplanned readmissions to the hospital were not associated with the new PPSH initiative. The readmission rate among PPSH observation unit patients was 4.7% as compared to 2.5% among the pre-PPSH observation unit candidates (\( P = .683 \)). The first postoperative pain score among PPSH observation unit patients was 1 (interquartile range, 0–5) as compared to a first postoperative pain score of 0 (interquartile range, 0–2) among pre-PPSH observation unit candidates (\( P = .093 \); Table 2). Segmented regression analysis did not find a statistically significant change on readmission rates from just before to just after implementation of the PPSH intervention (estimated change = −0.02; 95% CI, −0.18 to 0.03; \( P = .623 \); Figure 3). No patients in either group experienced emergent postoperative intubation or other expected complications.
Cost of Care Outcomes. Cost of care was calculated by hospital finance experts based on staff expenses, medical supplies and equipment, and operating room utilization using the Strata system (Strata Decision Technology, Chicago, IL). Total hospital costs were not lower for PPSH observation unit patients as compared to pre-PPSH observation unit candidates (difference = 8%; 95% CI, −7% to 23%). This cost reduction was due to a different level of skilled nursing care required in the observation unit cohort. Segmented regression analysis did not find a significant change in total costs associated with the PPSH intervention ($P = .321$).

### Table 2. Comparison of ICU and Observation Unit Patients and Candidates

<table>
<thead>
<tr>
<th></th>
<th>Pre-PPSH Observation Unit Candidates</th>
<th>PPSH Observation Unit Patients</th>
<th>Pre-PPSH ICU Candidates</th>
<th>PPSH ICU Patients</th>
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<tbody>
<tr>
<td><strong>Age (y)</strong></td>
<td>n = 79</td>
<td>n = 86</td>
<td>n = 36</td>
<td>n = 34</td>
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<tr>
<td></td>
<td>2 (1–4)</td>
<td>2 (1–5)</td>
<td>3 (1–9)</td>
<td>3 (2–6)</td>
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<td><strong>Payer mix</strong></td>
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<td></td>
</tr>
<tr>
<td>Public</td>
<td>20 (25%)</td>
<td>17 (20%)</td>
<td>10 (28%)</td>
<td>10 (29%)</td>
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<tr>
<td>Private</td>
<td>50 (63%)</td>
<td>51 (59%)</td>
<td>21 (58%)</td>
<td>21 (62%)</td>
</tr>
<tr>
<td>Mixed</td>
<td>5 (6%)</td>
<td>18 (21%)</td>
<td>5 (14%)</td>
<td>3 (9%)</td>
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<tr>
<td>Unavailable</td>
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<td>0 (0%)</td>
<td>0 (0%)</td>
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<td><strong>ASA physical status</strong></td>
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<td></td>
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<tr>
<td>I</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>1 (3%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>II</td>
<td>29 (37%)</td>
<td>30 (35%)</td>
<td>5 (14%)</td>
<td>10 (29%)</td>
</tr>
<tr>
<td>III</td>
<td>50 (63%)</td>
<td>52 (60%)</td>
<td>28 (78%)</td>
<td>22 (65%)</td>
</tr>
<tr>
<td>IV</td>
<td>0 (0%)</td>
<td>4 (5%)</td>
<td>2 (6%)</td>
<td>2 (6%)</td>
</tr>
<tr>
<td><strong>Postoperative disposition</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>ICU</td>
<td>70 (89%)</td>
<td>0 (0%)</td>
<td>34 (94%)</td>
<td>34 (100%)</td>
</tr>
<tr>
<td>Mandell</td>
<td>...</td>
<td>86 (100%)</td>
<td>...</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>PACU</td>
<td>9 (11%)</td>
<td>...</td>
<td>2 (6%)</td>
<td>...</td>
</tr>
<tr>
<td>OR duration (h)</td>
<td>1.6 (1.4–1.7)</td>
<td>1.5 (1.3–1.7)</td>
<td>1.6 (1.3–2.1)</td>
<td>1.6 (1.4–1.8)</td>
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<td>LOS (d)</td>
<td>2.1 (1.9–2.1)</td>
<td>2 (1.1–2.1)</td>
<td>2.1 (1.9–2.2)</td>
<td>2.1 (1.2–2.2)</td>
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<td>Readmission</td>
<td>2 (2.5%)</td>
<td>4 (4.7%)</td>
<td>3 (8.3%)</td>
<td>1 (2.9%)</td>
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<tr>
<td>First pain score</td>
<td>0 (0–2)</td>
<td>1 (0–5)</td>
<td>0 (0–4)</td>
<td>3 (0–6)</td>
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<tr>
<td>Time to first pain score (min)</td>
<td>158 (30–292)</td>
<td>35 (23–60)</td>
<td>.001</td>
<td>85 (23–215)</td>
</tr>
<tr>
<td>CCC count</td>
<td>2 (1–3)</td>
<td>2 (1–4)</td>
<td>5 (3–6)</td>
<td>3 (1–4)</td>
</tr>
<tr>
<td>Congenital</td>
<td>15 (19%)</td>
<td>29 (34%)</td>
<td>23 (64%)</td>
<td>14 (41%)</td>
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<tr>
<td>Cardiovascular</td>
<td>25 (32%)</td>
<td>20 (23%)</td>
<td>23 (64%)</td>
<td>17 (50%)</td>
</tr>
<tr>
<td>GI</td>
<td>18 (23%)</td>
<td>32 (37%)</td>
<td>28 (78%)</td>
<td>15 (44%)</td>
</tr>
<tr>
<td>Hematologic/immunologic</td>
<td>17 (22%)</td>
<td>17 (20%)</td>
<td>11 (31%)</td>
<td>6 (18%)</td>
</tr>
<tr>
<td>Malignancy</td>
<td>4 (5%)</td>
<td>5 (6%)</td>
<td>9 (11%)</td>
<td>2 (6%)</td>
</tr>
<tr>
<td>Metabolic</td>
<td>4 (5%)</td>
<td>4 (5%)</td>
<td>9 (25%)</td>
<td>1 (3%)</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>1 (1%)</td>
<td>3 (3%)</td>
<td>8 (22%)</td>
<td>4 (12%)</td>
</tr>
<tr>
<td>Neonatal</td>
<td>5 (6%)</td>
<td>2 (2%)</td>
<td>7 (19%)</td>
<td>1 (3%)</td>
</tr>
<tr>
<td>Neuromuscular</td>
<td>14 (18%)</td>
<td>9 (10%)</td>
<td>16 (44%)</td>
<td>6 (18%)</td>
</tr>
<tr>
<td>Renal</td>
<td>3 (4%)</td>
<td>8 (9%)</td>
<td>3 (8%)</td>
<td>3 (9%)</td>
</tr>
<tr>
<td>Respiratory</td>
<td>79 (100%)</td>
<td>86 (100%)</td>
<td>36 (100%)</td>
<td>34 (100%)</td>
</tr>
</tbody>
</table>

Values are median (interquartile range) for continuous variables and frequency (%) for categorical variables. $P$ values are calculated using the Wilcoxon rank sum test for continuous variables and Fisher exact test for categorical variables. The $P$ value for first pain score is adjusted for time to first pain score. Any $P$ value less than .05 is statistically significant, which is reflected in boldface. Abbreviations: ASA, American Society of Anesthesiologists; CCC, complex chronic conditions; GI, gastroenterologic; ICU, intensive care unit; LOS, length of stay; OR, operating room; PACU, postanesthesia care unit; PPSH, Pediatric Perioperative Surgical Home.

*P* values are comparing PPSH observation unit patients versus pre-PPSH observation unit candidates.

Figure 2. The number of patients with each postoperative disposition among the pre-PPSH observation unit candidates, PPSH observation unit patients, pre-PPSH ICU candidates, and PPSH ICU patients. The proportion of patients with a postoperative disposition of being sent to the ICU significantly dropped comparing pre-PPSH observation unit candidates and PPSH observation unit patients. ICU indicates intensive care unit; PACU, postanesthesia care unit; PPSH, Pediatric Perioperative Surgical Home.
capacity management. The availability of ICU capacity has
which is an important finding in the context of hospital
ability of beds for high-acuity medical and surgical patients,
cleft patients resulted in a subsequent increase in the avail-
substantially without an increase in postoperative compli-
to laryngeal cleft repair. By using the PPSH framework for
DISCUSSION

Figure 3. Postoperative outcome data are displayed in panels A,
B, and C. Segmented regression analysis of (A) rates over time of
ICU utilization. Test of change in average level from just before to
just after implementation of the PPSH intervention (P = .126) and
test of change in slope after PPSH (P = .956). B, Mean length of
stay over time. Test of change in average level from just before to just
after implementation of the PPSH intervention (P = .567) and
test of change in slope after PPSH (P = .384). C, Readmission rates
over time. Test of change in average level from just before to just
after implementation of the PPSH intervention (P = .472) and test of
change in slope after PPSH (P = .623). All red vertical dashed lines
represent the test of the change in average level from just before to
just after implementation of the PPSH intervention. ICU indicates
intensive care unit; PPSH, Pediatric Perioperative Surgical Home.

This model demonstrates a novel PPSH directed approach
to laryngeal cleft repair. By using the PPSH framework for
process improvement, rates of ICU utilization decreased
substantially without an increase in postoperative complica-
tions or rate of readmission, both important measures of
patient safety. The reduction in ICU admission for laryngeal
cleft patients resulted in a subsequent increase in the avail-
ability of beds for high-acuity medical and surgical patients,
which is an important finding in the context of hospital
capacity management. The availability of ICU capacity has
been found to impact clinical decision-making when high-
acuity patients are less likely to be admitted to the ICU when
bed availability is low.18,19 The lack of ICU resources may also
increase the risk of overall patient mortality.20,21 These asso-
ciations between resource availability and patient course as
described in the literature illustrate an area where the PPSH
model, with its focus on perioperative standardization and
risk stratification, can improve health outcomes. This PPSH
study supports the hypothesis that increased investment
in the preoperative period through careful triage based on
patient comorbidities can result in decreased resource utiliza-
tion without compromising patient safety, with a result of
better value in health care as defined by quality, safety, and
patient satisfaction with respect to cost.22

Health care in the United States has recently under-
gone a large number of changes that have transformed care
from volume based to value based. The primary driver for
this change has been the Center for Medicare & Medicaid
Services, followed by commercial payers.23,24 The movement
away from “fee-for-service” reimbursement to flat-rate bun-
dled payments is an attempt to encourage care coordination
among health care providers, which consequently reduces
the patient’s risk of adverse outcomes.25 Engaging perio-
ervative physicians in the process of reducing health care costs
while improving patient outcomes is a critical component
of health care reform. Single bundled payments that include
all costs of the entire surgical episode will require careful
alignment of treatment that optimizes outcomes in the most
economically efficient manner.26 However, surgical bundled
payments are not a solution to the problems of medical inef-
ficiency but rather an encouragement to test and implement
value-driven care models, such as the PSH.

The implementation of a pediatric PSH model requires
input from a variety of stakeholders, both executive and
clinical.27 It is through these multiple approaches to patient
care: clinical, operational, logistical, and analytical, that an
institution can create a successful structure for more efficient
patient care without compromising quality. Disrupting the
standard clinical throughput for a specific patient popula-
tion poses challenges. The PPSH framework, which has
been described here, provides a discreet structure on which
to implement evidence-based change.28 The additional use
of process mapping provides context for clinicians to under-
stand their role in the team-based perioperative approach
to the surgical episode of care for a specific patient popu-
lation.29 Clarification and understanding of the shared
responsibilities that other providers have for a common
patient population may decrease duplication of care efforts.

One challenge specific to the PPSH as compared to other
integrated care models is that the pediatric surgical popula-
tion is fundamentally different than the adult surgical popu-
lation.30,31 The translation of care integration initiatives from
the adult to the pediatric population may seem intuitive,
but pediatric patients frequently present with chronic con-
ditions and comorbidities not seen in adults. As a result of
these differences, the pediatric population requires a sepa-
rate—but parallel—development of a PSH, including varied
medical specialists, parents, and social workers.32,34 Despite
this challenge, the preliminary benefits of an integrative,
standardized preoperative optimization program for com-
plex patients have been substantial. Many institutions have

Laryngeal Cleft Repair Perioperative Surgical Home

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already reported positive outcomes with the implementation of PSH initiatives, 3,4,6,7 Encouraged by these early successes, others have advocated for expanding their PSH programs to include more pediatric surgical populations.30,31

Our study should be considered in the context of its limitations. One limitation is the relatively small sample size due to the low prevalence of laryngeal cleft. The implementation of PPSH as the study design includes a preimplementation period and a postimplementation period. The most appropriate method for statistical analysis method for these data is a segmented regression time-series analysis. However, this method requires a large enough sample size to estimate outcomes at regular, evenly spaced intervals in both time periods. We are unable to precisely estimate the rate of ICU utilization, our primary outcome, during each time interval with our sample size. While we are unable to adequately perform segment regression and adjust for confounding, our approach of identifying pre-PPSH observation unit candidates reveals comparability between these patients and observation unit patients in the post-PPSH period. A second limitation of our study is the lack of a patient/family satisfaction metric. We attempted to use patient satisfaction survey scores from a commercially available tool, but the survey response rate was too low for conclusions to be drawn. Previous studies have shown that adult patients admitted to the ICU can have persistent psychological symptoms of stress postdischarge, and similar symptoms of stress can be found in the parents of pediatric ICU patients.35–38 Therefore, one can hypothesize that higher patient and family satisfaction could be associated with reduced ICU admission rates. Further research is needed to determine the impact of bypassing the ICU through a PPSH initiative on patient and family psychosocial health.

Ultimately, the nuances of implementing an integrated care program are institution specific. There is no universal perioperative pathway that will decrease cost and improve quality at every institution; however, the pediatric PSH is a method for a comprehensive approach to pediatric surgical patients, which results in value added for discrete patient populations.

DISCLOSURES
Name: Izabela Leahy, MS.
Contribution: This author helped design the study design/generate the idea, manage and analyze the data, review the literature, and compose and edit the manuscript.

Name: Connor Johnson, BS.
Contribution: This author helped design the study design/generate the idea, manage and analyze the data, review the literature, and compose and edit the manuscript.

Name: Steven J. Staffa, MS.
Contribution: The author helped manage and analyze the data and compose and edit the manuscript.

Name: Reza Rahbar, MD, DMD.
Contribution: This author helped design the study design/generate the idea, manage and analyze the data, review the literature, and compose and edit the manuscript.

Name: Lynne R. Ferrari, MD.
Contribution: This author helped design the study design/generate the idea, manage and analyze the data, review the literature, and compose and edit the manuscript.

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REFERENCES