



30-Day morbidity after augmentation enterocystoplasty and appendicovesicostomy: A NSQIP pediatric analysis

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Summary

Introduction

Augmentation enterocystoplasty and appendicovesicostomy are complex pediatric urologic procedures. Although there is literature identifying long-term outcomes in these patients, the reporting of short-term postoperative outcomes has been limited by small numbers of cases and lack of prospective data collection. Here we report 30-day outcomes from the first nationally based, prospectively assembled cohort of pediatric patients undergoing these procedures.

Objective

To determine 30-day complication, readmission and reoperation after augmentation enterocystoplasty and appendicovesicostomy in a large national sample of pediatric patients, and to explore the association between preoperative and intraoperative characteristics and occurrence of any 30-day event.

Study design

We queried the 2012 and 2013 American College of Surgeons National Surgical Quality Improvement Program Pediatric database (ACS-NSQIPP) for all patients undergoing augmentation enterocystoplasty and/or appendicovesicostomy. Surgical risk score was classified on a linear scale using a validated pediatric-specific morbidity score. Intraoperative characteristics and postoperative 30-day events were reported from prospectively collected data. A composite measure of complication, readmission and/or reoperation was used as primary outcome for the multivariate logistic regression.

Results

There were 461 patients included in the analysis: 245 had appendicovesicostomy, 97 had augmentation enterocystoplasty and 119 had both procedures. There were a total of 110 NSQIP complications seen in 87 patients. The most common complication was urinary tract infection (see Table for 30-day outcomes by patient). The composite measure of any 30-day event was seen in 27.8% of the cohort and this was associated with longer operative time, increased number of procedures done at time of primary surgical procedure and higher surgical risk score.

Discussion

The ACS-NSQIPP provides a tool to examine short-term outcomes for these complex urologic procedures that has not been possible before. Although ACS-NSQIP has been used extensively in the adult surgical literature to identify rates of complications, and to determine predictors of readmission and adverse events, its use in pediatric surgery is new. As in the adult literature, the goal is for standardization of practice and transparency in reporting outcomes that may lead to reduction in morbidity and mortality.

Conclusion

In this cohort, any 30-day event is seen in almost 30% of the patients undergoing these urologic procedures. Operative time, number of concurrent procedures and higher surgical risk score all are associated with higher odds of the composite 30-day event of complication, readmission and/or reoperation. These data can be useful in counseling patients and families about expectations around surgery and in improving outcomes.

Table 30-day events by patient.

	Patients, <i>n</i> = 461
Any NSQIP complications	87 (18.9)
UTI	43 (9.3)
Wound complications	
Superficial SSI	19 (4.1)
Deep SSI	4 (0.9)
Organ SSI	5 (1.1)
Dehiscence	8 (1.7)
Pneumonia	1 (0.2)
Reintubation	1 (0.2)
Bleeding/transfusion	19 (4.1)
Sepsis	8 (1.7)
Central line infection	1 (0.2)
Renal failure	1 (0.2)
Other 30-day outcomes	
Readmission	62 (13.5)
Reoperation	32 (6.9)
Composite 30-day event	128 (27.8)

Data given as *n* (%).

Introduction

Augmentation enterocystoplasty and appendicovesicostomy are some of the most complex and rare procedures within pediatric urology. This makes reporting outcomes and improving care of these patients difficult, as even busy centers perform relatively few procedures. Studies to date looking at outcomes from these procedures have often focused on long-term outcomes, including stones, metabolic abnormalities, stomal stenosis, bladder perforation, infection, need for further surgery and death [1–5]. There is scant literature on other aspects of quality of surgical care, particularly regarding short-term postoperative outcomes and morbidity.

The purpose of this study was to use a prospective national database to report 30-day events after appendicovesicostomy (AV), augmentation enterocystoplasty (AE) and augmentation enterocystoplasty with appendicovesicostomy (AE+AV). Our aims were to 1) describe 30-day complication rates, readmission rates and reoperation rates, and 2) identify patient and operative characteristics associated with any 30-day adverse event in these procedures.

Methods

Study design and data source

We conducted a cohort study of pediatric patients using the 2012 and 2013 American College of Surgeons National Surgical Quality Improvement Program-Pediatric Database (ACS-NSQIPP). The ACS-NSQIPP is a prospective national sample of pediatric cases in patients 0–17 years of age. In 2012 and 2013, there were 50 participating sites and up to 147 variables collected, including preoperative risk factors, intraoperative variable, and 30-day postoperative mortality and morbidity outcomes for patients undergoing major surgical procedures in both the inpatient and outpatient settings. There is a trained surgical clinical reviewer (SCR) at each site who collects data and tracks 30-day outcomes for every patient [6].

Patient selection

We identified all patients with a CPT code and description for enterocystoplasty with intestinal anastomosis (CPT 51960) and/or cutaneous appendicovesicostomy (CPT 50845). The CPT codes were assigned as the principal operative procedure or as a concurrent procedure.

Variables

We extracted multiple patient characteristics from the dataset, including age, gender, race and ethnicity, height, weight, diagnosis and comorbidities. BMI category was calculated using z-scores to account for age, weight and height according to CDC categories [7]. The categories were normal (<85th percentile), overweight (85th–<95th percentile) and obese (\geq 95th percentile). The operative characteristics included operative time in hours, type of procedure, number of concurrent procedures done at time of primary surgical procedure and length of stay. Procedure

count was categorized as one procedure, two to five procedures and greater than five procedures.

Surgical risk score

Using the validated multispecialty surgical risk score developed by Rhee et al., we assigned a risk score to each patient based on preoperative patient characteristics and comorbidities [8]. This validated 7-category point scale can be used for risk stratification and predicts inpatient mortality in the pediatric population better than the Charlson Comorbidity Index, which is primarily used in adults for risk stratification. In this cohort, we dichotomized the surgical risk score into low-risk score (score 0–1) and high-risk score (score 2–6).

Complications and outcomes

ACS-NSQIP Pediatric collects data on 21 defined postoperative complications that are tracked for 30 days following surgery. These can be viewed in [Appendix A](#). We combined superficial, deep, organ/space surgical site infection and wound disruption into a single “wound complications” outcome. We analyzed NSQIP complications for the patients undergoing AV, AE or AE+AV. Readmission and unplanned reoperation within 30 days after primary surgery were also collected. Reasons for readmission are not required to be collected in NSQIP; however, we reported reason for readmission for those patients for whom a NSQIP complication or ICD-9 diagnostic code was provided. Unplanned reoperations were recorded using CPT codes. A composite adverse event measure was used to indicate occurrence of any 30-day event, which included complication, readmission and/or reoperation.

Statistical analysis

Descriptive statistics were used to characterize the population of patients undergoing AV, AE and AE+AV. Univariate and multivariate associations between patient and procedure characteristics and the composite any 30-day event were investigated using logistic regression. Statistically significant covariates in univariate analyses and clinically important covariates were included in the multivariate model. Functional forms of continuous covariates were evaluated. Diagnostic and multicollinearity checks of the final model were performed. Analyses were performed using SAS, version 9.3. A two-tailed *p* value of less than 0.05 was considered significant.

Results

Characteristics of patients

We identified 461 patients in 2012 and 2013 ACS-NSQIPP with the defined CPT codes; 245 patients had AV, 97 patients had AE and 119 patients had AE+AV. The majority of these patients were white, non-Hispanic (71.4%) and female (57.3%), and the median age was 9.4 years (IQR 6.1–12.3). The majority of patients had a low-risk surgical risk score (84.4%). The primary diagnoses assigned to patients were: 251

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