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Is all-cause readmission an appropriate performance measure for pediatric surgeons? A case study in pyloromyotomy

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ABSTRACT

Introduction: All cause readmissions are used as a surrogate metric for quality of care for both hospitals and physicians, and are considered in pay for performance initiatives. However, the integrity of using all cause readmissions as a benchmark for surgical outcomes has received little attention. Pyloromyotomy for hypertrophic pyloric stenosis is considered a safe pediatric surgical procedure with few complications or readmissions. The incidence of in hospital complications has been reported, however the rate of readmissions and specifically the proportion of readmissions related to surgical complications have not been previously reported.

Methods: Data were abstracted from the longitudinally linked Office of Statewide Health Planning and Development data from the State of California from 1995 to 2009, allowing patient tracking across all hospitals and years within California. Inclusion criteria were primary procedure code of pyloromyotomy, a diagnosis code of hypertrophic pyloric stenosis, and no prior record of any in-hospital admission.

Results: A total of 1900 patients were identified: 16.8% girls, 31.7% whites, 5.1% blacks, and 58.2% Hispanics. The median length of stay was 2 days (IQR 2–3 days). The in-hospital complication rate was 5.16% and overall complication rate was 6.84%; there were no deaths. The rate of 30-day all-cause readmission was 4.01%, with a median of 0% across hospitals (IQR 0%–1.1%); and 13.2% of readmissions occurred at a different hospital. Surgically-related readmission rate was 2.16%. Surgically-related readmission comprised 36% readmissions at 30 days, but only 13% readmissions overall. The top three primary diagnoses on readmission were respiratory infections (43%), nonrespiratory infections (14%) and other nonsurgical GI indications (14%). All-cause readmissions at 60 days, 90 days, 180 days, and 1 year were 5.8%, 7.3%, 10.4%, and 13.7%, respectively.

Conclusion: Thirty-day readmission for a surgical complication occurs in 1 of 50 patients undergoing a pyloromyotomy for hypertrophic pyloric stenosis but for all causes is twice as likely, 1 in 25 patients. All-cause readmission is an inadequate measure for the quality of surgical care and the performance of pediatric surgeons. This is a Prognostic Study with Level II Evidence.

More than ever before, surgeons are required to provide proof of measurably high quality and safe surgical care. Where in the past, patients had to rely on board certificates, medical degrees and verbal assurances of a surgeon's standard of practice, there are now more nuanced and frequently changing ways to determine the quality of a surgeon's work and the hospital in which they practice. Measurement of performance indicators such as infection rates, complications and readmissions is used increasingly to determine pay-for-performance premiums, with the goal of incentivizing high quality and improving patient outcomes. However, with such systems based on findings in internal medicine, their applicability to surgical procedures is not well substantiated.

All surgical specialties, including pediatric surgery, lack robust information on baseline performance levels. Contributing to this is a lack of information on long-term outcomes for pediatric surgical conditions, caused in part by the difficulty in conducting long-term follow-up in single institution studies. We used a population data set which offers a unique opportunity to compile complete patient histories over many years, including readmissions to different centers, to investigate readmission rates for a common, simple pediatric surgical procedure.

Hypertrophic pyloric stenosis (HPS) has an incidence of 1–3 per 1000 live births in Western countries [1]. Pyloromyotomy is generally occurs in healthy infants and is considered to be a safe procedure, with in hospital complication rates reported between 1.2% and 4.9% from single-center studies. The incidence of long-term complication and readmission rates are wholly unknown.

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This study aimed to determine the overall complication rate and the hospital readmission rate for pyloromyotomy, a common and purportedly safe pediatric surgical procedure, to assess the validity of using all cause readmissions in pediatric surgical patients as a performance level for surgeons and hospitals.

1. Methods

Retrospective longitudinal analysis of the California Office of Statewide Health Planning and Development patient discharge database (PDD) was performed for the years 1995 to 2010. This database contains all inpatient admissions in public and private hospitals in the state of California, excluding US military and Veterans Affairs hospitals. These data are de-identified with encrypted ID assignments, with a unique record linkage number (ie, encrypted social security number) that allows patients to be tracked through all hospitals and years. Records from the PDD were linked with the California Death Statistical Master File to obtain data on out-of-hospital mortality.

All patients with a pyloromyotomy procedure code (43.3) defined by ICD-9-P (International Classification of Procedures, Ninth Revision, Clinical Modification) (ICD-9 Procedure) were included. Patients without a diagnosis of HPS, defined by ICD-9-CM (International Classification of Diseases, Ninth Revision, Clinical Modification) code (750.5), were excluded, along with those for whom pyloromyotomy was not the primary procedure. The former was to account for coding errors and the latter in order to limit the study to routine HPS cases. To a similar end, those with a prior hospital admission were also excluded in order to focus on those without complex congenital conditions, as well as patients older than the age of one (see Fig. 1). Only patients with a valid record linkage number were included in the analysis, in order to effectively follow patients over time.

The primary outcome of interest was all cause readmission following pyloromyotomy within 30, 60, 90, 180 and 365 days. We reviewed all readmissions and categorized them into postoperative complications, respiratory infection, nonrespiratory infection, miscellaneous pediatric/congenital condition, GERD (reflux), other nonsurgical GI and child abuse. We defined the following codes as postoperative complication: hypovolemia (276.5) dehydration (276.51), stomach function dis nec (536.8), acq pyloric stenosis (537.0), pylorospasm (537.81), vomiting post-gi surgery (564.3), intestinal malabsorption nec (579.8), vomiting alone (787.03), surg comp-digestv system (997.4), postop wound disruption (998.3, 998.32), postoperative infection (998.5, 998.59) and surgery follow-up (V67.0). Readmissions considered unrelated to surgery included respiratory infection: bronchiolitis/bronchitis/pneumonia, asthma or cough (465,466,4803,486,493, 786); nonrespiratory infection: viral infections (079), meningitis (047.9, 359.1), UTI/pyelonephritis (590.80,599, 771.82); miscellaneous/congenital conditions: progressive muscular dystrophy, perinatal conditions (779.89), sleep apnea (780.57, 778) and laryngeal anomaly (748.3); esophageal reflux (530.81); other nonsurgical GI: allergic and infectious colitis (558); and child abuse/neglect (995.5). Age, ethnoracial group, and sex were recorded in the PDD. Descriptive analysis of the patient cohort was based on the index admission.

Statistical analysis was performed with Stata SE statistical software, version 11.2 (StataCorp LP, College Station, TX). Graphs were created in Excel. Half-life was calculated using natural logarithms. The rate of pyloromyotomy in different ethnoracial groups was calculated using California state data and averaging birth-rate over the years 2002, 2003, 2004, 2005, 2006 and 2010. We then divided incidence of pyloromyotomy found in PDD by the averaged state birth rate for each group.

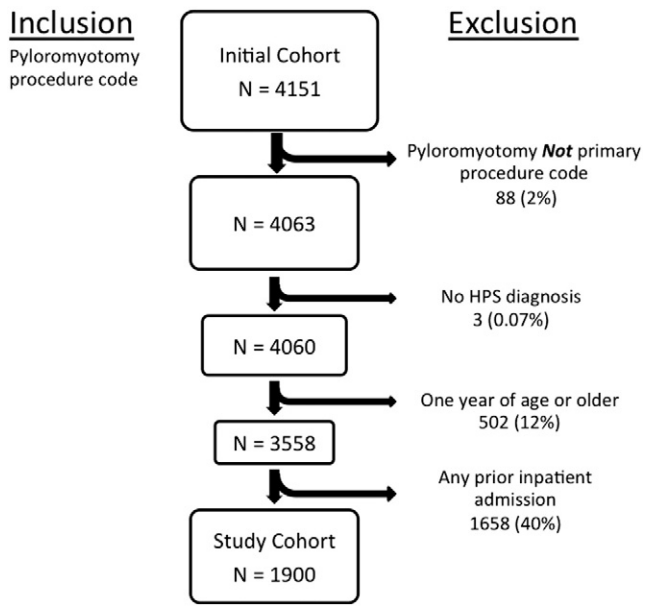

Fig. 1. Inclusion and exclusion criteria flowchart.

2. Results

A total of 4190 patients were found on initial search. 1658 (39.9%) were excluded owing to prior hospitalization, 88 (2.1%) who underwent pyloromyotomy as a secondary procedure, 502 (12.1%) because they were greater than 1 year old and 3 (0.07%) who did not have a diagnosis of pyloric stenosis. Although the exclusion of nearly 40% of patients for prior admission seemed high, the reason for prior admission is unclear and we explicitly intended this cohort to include only healthy infants. We also know that in the PDD, <10% of these 'prior admissions' represented the admission for birth. This left 1900 cases of pyloromyotomy in the study population. Table 1 shows demographic information from the study population. A large number of Hispanic infants underwent pyloromyotomy; making up 58.2% cases but just 50% of population in 2010 California birth demographics [2]. Much lower rates of pyloromyotomy were seen in Asian infants, who made up 12% births in 2010, but just 1.4% of pyloromyotomy cases. This infers that Asian infants are more than 10 times less likely to require a pyloromyotomy than a black infant or white infant, and even more so compared to Hispanic infants, a trend that has been noted previously [3]. An in-hospital complications rate was 5.16%, and overall complication was 6.84%. There were no deaths. Average follow-up time for patients was 7.4 years.

Fig. 2 shows all cause readmissions, as well as surgical readmission over a one-year period. All-cause readmission was 4.01% at 30 days. 7.3% at 90 days and 13.7% at one year. Of those readmissions however, surgical readmissions comprised only 36% (27/76) within the first 30 days. The majority of surgical readmissions occurred within the first 30 days (84%) (27/32). All-cause readmission mapped very well onto a logarithmic curve, with the likelihood of requiring readmission halving every 50 days. Primary readmission diagnoses were

Table 1
Demographics.

Demographics table	Number	Percentage
Female gender	320	16.84
Race		
White	594	31.71
Black	95	5.07
Hispanic	1090	58.2
Asian	26	1.39
Other	68	3.63
LOS	2	N/A
Death	0	0
Complications	98	5.16