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Original Articles

Trends in common surgical procedures at children's and nonchildren's hospitals between 2000 and 2009☆,☆☆

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ABSTRACT

Purpose: Though growth in children's surgical expenditures has been documented, procedure-specific differences in volume and costs at children's hospitals (CH) and non-hildren's hospitals (NCH) have not been explored. Our purpose was to compare trends in volume and costs of common pediatric surgical procedures between CH and NCH.
Methods: We performed a review of the 2000–2009 Kids' Inpatient Database identifying all cases of appendectomy for uncomplicated appendicitis (AP), tonsillectomy and adenoidectomy (TA), fundoplication (FP), humeral fracture repair (HFR), pyloromyotomy (PYL), and cholecystectomy (CHOLE). Trends in case volume and costs were examined at CH versus NCH.
Results: The proportion of surgical care at CH increased for all procedures from 2000 to 2009. TA and CHOLE demonstrated higher costs per case at CH. Positive growth over time in cost per case at CH was seen for AP and FP, with the cost per case of FP increasing by 21% between 2006 and 2009.
Conclusions: The proportion of surgeries performed at CH is continuing to grow alongside proportionate increases in costs, however costs for certain procedures are higher at CH than NCH. Further investigation is needed to explore cost containment at CH while still maintaining specialized, high quality surgical care.
Level of evidence: Level III.

Discussions focused on health care delivery reform have become increasingly prevalent as a result of national efforts to improve quality and reduce per capita health care costs. Much of the debate over how to maximize value in health care has centered on adult care, likely owing to the fact that less than 3% of hospitals nationwide are recognized as children's hospitals (CH) [1]. Previous studies have documented significant growth in the volume and cost of pediatric inpatient care in recent years [1,2,3]. Concerns over this growth have encouraged researchers to not only examine the economic and epidemiological reasons for the phenomenon, but also determine whether hospital costs and health outcomes for specific surgical procedures vary by the size and type of hospital in which the pediatric care is provided [4–7].

The pediatric population is unique in its ability to receive clinical care at hospitals designed solely for their use. With improved access to subspecialty care and greater expertise for rare and complex pediatric conditions, CH are often the preferred destination for children in need of even the most common surgical and nonsurgical treatments. To study whether CH are in fact superior to nonchildren's hospitals (NCH) in providing higher quality pediatric care, prior research has focused on complex clinical conditions that often lead to surgery and are consistently significant contributors to hospital costs, volume, and resource utilization [8–10].

However, investigations into national trends in both the volume and costs of more common and lower acuity pediatric procedures at CH compared to NCH are lacking in the current literature. Our purpose was to compare trends in volume and costs of common pediatric surgical procedures at CH and NCH between 2000 and 2009.

1. Methods

1.1. Study design

National trends in the volume, cost, and severity of pediatric care between CH and NCH were compared using four previous releases (2000, 2003, 2006, and 2009) of the Kids' Inpatient Database (KID). The KID is a

Abbreviations: CH, children's hospital; NCH, nonchildren's hospital; KID, Kid's Inpatient Database; HCUP, Healthcare Cost and Utilization Project; AP, uncomplicated appendectomy; TA, tonsillectomy and adenoidectomy; FP, fundoplication; HFR, humeral fracture repair; PYL, pyloromyotomy; CHOLE, cholecystectomy; CCR, cost-to-charge ratio; AHRQ, Agency for Healthcare Research & Quality.

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Table 1
Characteristics of inpatient discharges at children's hospitals (CH) vs. nonchildren's hospitals (NCH) in the KID between 2000 and 2009.

	CH	*NCH*
Age at Admission (Years; Mean +/− SE)	6.6 ± 0.2	12.1 ± 0.1
(Median (IQR))	5.9 (0.7, 11.2)	13.9 (6.0, 17.6)
Female (N = 269,079)	17,218 (37.7 ± 1.3%)	113,553 (50.8 ± 0.7%)
Race (N = 215,459)		
White	16,174 (45.6 ± 7.3%)	107,161 (59.5 ± 1.6%)
Black	4195 (11.8 ± 2.8%)	18,384 (10.2 ± 0.9%)
Hispanic	12,335 (34.8 ± 8.4%)	41,199 (22.9 ± 1.5%)
Asian or Pacific Islander	601 (1.7 ± 1.5%)	3392 (1.9 ± 0.3%)
Native American	148 (0.4 ± 0.3%)	1581 (0.9 ± 0.2%)
Other	1996 (5.6 ± 1.7%)	8293 (4.6 ± 0.6%)
Median Household Income (N = 221,471)		
$1–$24,999	10,098 (26.0 ± 4.0%)	49,923 (27.3 ± 1.4%)
$25,000–$34,999	8852 (22.8 ± 1.9%)	46,124 (25.2 ± 0.8%)
$35,000–$45,999	9997 (25.8 ± 2.5%)	43,944 (24.1 ± 0.7%)
$45,000 and above	9826 (25.3 ± 3.9%)	42,708 (23.4 ± 1.5%)
Primary Expected Payer (N = 275,553)		
Medicare	24 (0.1 ± 0.0%)	495 (0.2 ± 0.1%)
Medicaid	19,736 (42.5 ± 4.0%)	77,774 (33.9 ± 1.1%)
Private (including HMO)	22,744 (49.0 ± 4.4%)	123,658 (54.0 ± 1.2%)
Self-pay	1593 (3.4 ± 1.0%)	17,251 (7.5 ± 0.5%)
No Charge	40 (0.1 ± 0.0%)	1203 (0.5 ± 0.1%)
Other	2299 (5.0 ± 2.0%)	8735 (3.8 ± 0.3%)
Patient's County Location[a] (N = 165,014)		
Central (Pop > = 1 million)	15,633 (53.5 ± 11.2%)	41,459 (30.5 ± 2.5%)
Fringe (Pop > = 1 million)	6199 (21.2 ± 6.6%)	20,512 (22.6 ± 1.9%)
Metro (Pop. 50,000–999,999)	4863 (16.7 ± 8.5%)	27,410 (30.0 ± 2.6%)
Micropolitan	1548 (5.3 ± 2.1%)	9078 (10.6 ± 0.7%)
Not Metropolitan or Micropolitan	963 (3.3 ± 1.4%)	5438 (6.3 ± 0.6%)
Admission Source (N = 206,638)		
ER	16,094 (44.9 ± 5.8%)	100,440 (58.8 ± 1.5%)
Another Hospital	1819 (5.1 ± 1.7%)	3911 (2.3 ± 0.3%)
Another facility (including l/t care)	1140 (3.2 ± 2.2%)	1864 (1.1 ± 0.3%)
Court/Law Enforcement	19 (0.1 ± 0.1%)	24 (0.0 ± 0.0%)
Routine/Birth/Other	16,745 (46.8 ± 5.3%)	64,582 (37.8 ± 1.3%)
Length of Stay (Days; Mean +/− SE)	2.87 ± 0.12	2.29 ± 0.03
(Median (IQR))	1.2 (0.5, 1.9)	1.1 (0.5, 1.9)
Hospital Bed Size (N = 266,289)		
Small	13,148 (32.0 ± 10.4%)	21,526 (9.6 ± 0.9%)
Medium	22,979 (56.0 ± 10.3%)	55,540 (24.7 ± 1.7%)
Large	4931 (12.0 ± 7.8%)	148,165 (65.8 ± 2.0%)
Hospital Teaching Status (N = 266,289)		
Teaching Hospital	39,638 (96.5 ± 2.7%)	113,456 (50.4 ± 2.4%)
Non-Teaching Hospital	1420 (3.5 ± 2.7%)	111,775 (49.6 ± 2.4%)

SD = Standard Deviation, HMO = Health Maintenance Organization.
[a] Only available for 2006 and 2009.

national administrative and billing dataset sponsored by the Agency of Healthcare Research & Quality that was developed for the Healthcare Cost and Utilization Project (HCUP). The database contains approximately 3 million pediatric discharge records with additional hospital discharge-level data for patients less than 21 years of age [11]. All discharge records are sampled from community, nonrehabilitation hospitals in those states, spanning all regions of the U.S., who agreed to participate in HCUP (27 states in 2000, 36 states in 2003, 38 states in 2006, and 44 states in 2009). National estimates of discharges and total charges are generated using HCUP weights, which are determined by stratifying hospitals according to their ownership type, bed size, teaching status, rural/urban location, region of the U.S., and designation as a freestanding children's hospital. Discharge records from each hospital are randomly sampled to include 10% of uncomplicated births and 80% of complicated births alongside other pediatric cases [11]. More than 100 clinical and nonclinical data elements are available for each hospital record, spanning from patient demographics to hospital charges and diagnosis and procedure codes.

Each hospital within the KID is a nonrehabilitation, acute care hospital considered to be a children's general hospital, children's specialty hospital, a children's unit in a general hospital, or an NCH. For the purpose of this study, “children's hospitals” were defined as freestanding hospitals (children's general hospitals and children's specialty hospitals) [12]. The 2012 KID restructured the definition of CH and NCH, precluding the inclusion of data from that year in this study.

1.2. Data analysis

The primary outcomes of this study were trends in the volume and cost of care provided at CH and NCH for each of the following procedures: laparoscopic appendectomy (AP) for uncomplicated appendicitis, tonsillectomy and adenoidectomy (TA), fundoplication (FP), humeral fracture repair (HFR), pyloromyotomy (PYL), and laparoscopic cholecystectomy (CHOLE). To identify hospitalizations for routine AP, all discharges corresponding to the ICD-9 procedure code for laparoscopic appendectomy (47.01), the ICD-9 diagnosis code for acute appendicitis (540.9), and a length of stay of no more than 2 days were used. Hospital discharges following TA were included only in patients of age 12 or under and were coded using procedure codes for tonsillectomy alone (28.2), tonsillectomy with adenoidectomy (28.3), and adenoidectomy alone (28.6). ICD-9 procedure code 44.67 identified all discharges following FP. Humeral fracture repairs were restricted to those with and without internal fixation (79.31, 79.21). Infants ≤3 months of age undergoing PYL (43.3) were included. Discharges for any diagnosis following CHOLE (51.23) were included. Only primary ICD-9 diagnosis and procedure codes were included for analysis in order to minimize the clinical complexity of our patient cohort.

The volume of care was measured by both the number of pediatric discharges and discharges per 100,000 children. National estimates were calculated using discharge weights defined by the KID in all