Acute Pancreatitis Admission Trends: A National Estimate through the Kids' Inpatient Database

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Objectives To evaluate national health care use and costs for pediatric acute pancreatitis.

Study design The Kids' Inpatient Database for 2006, 2009, and 2012 was queried for patients with a principal diagnosis of acute pancreatitis. Cases were grouped by age: preschool (<5 years of age), school age (5-14 years of age), and adolescents (>14 years of age).

Results A total of 27 983 discharges for acute pancreatitis were found. The number of admissions increased with age: young n = 1279, middle n = 8012, and older n = 18 692. Duration of stay was highest in preschool children (median, 3.47 days; IQR, 2.01-7.35), compared with school age (median, 3.22 days; IQR, 1.81-5.63) and adolescents (median, 2.87 days; IQR, 1.61-4.81; $P < .001$). The median cost of hospitalization varied with age: $6726 for preschoolers, $5400 for school-aged children, and $5889 for adolescents ($P < .001$). Acute pancreatitis–associated diagnoses varied by age. The presence of gallstone pancreatitis, alcohol, and hypertriglyceridemia was more common among older children compared with younger children ($P < .001$). There was an increasing trend in acute pancreatitis, chronic pancreatitis, and obesity for the 2 older age groups ($P < .001$).

Conclusion Admission of children for acute pancreatitis constitutes a significant healthcare burden, with a rising number of admissions with age. However, the cost and duration of stay per admission are highest in young children. *(J Pediatr 2018;194:147-51).*

See editorial, p 11 and related article, p 142

Acute pancreatitis in children is increasingly recognized and growing in incidence.[1,2] An estimated incidence of 1 in 10 000 cases occur in children based on single-center studies.[2] Factors that have led to the increasing incidence in children are not fully understood. Although the majority of acute pancreatitis attacks are self-limited, with spontaneous resolution, a subset of patients progress to severe acute pancreatitis with morbidity in up to 25% and mortality in about 0.5%.[3-6]

Signs and symptoms of acute pancreatitis differ in younger children as compared with older children.[7] We hypothesized that pediatric acute pancreatitis constitutes a significant healthcare burden, and that age affects acute pancreatitis risk factors as well as healthcare use and outcomes in the pediatric population. We further hypothesized that obesity and chronic pancreatitis have important impacts on these trends. There are limited studies that characterize the hospital course, inpatient procedures, clinical outcomes, mortality, and disease burden in children with acute pancreatitis.[8-10] Current published studies lack information about the national health care use for children with acute pancreatitis, because most studies are single center and retrospective in nature.[7]

We analyzed data from the Kids' Inpatient Database (KID) on admissions for acute pancreatitis and describe factors that impact trends, healthcare use, and disease outcome in the US. We also evaluated patient characteristics and comorbid conditions of children with acute pancreatitis and their outcomes as they relate to age.

Methods

The KID is part of a family of databases and software tools developed for the Healthcare Cost and Utilization Project (HCUP) (https://www.hcup-us.ahrq.gov/overview.jsp). KID is the largest publicly available, all-payer pediatric inpatient care database in the US covering patient data from 44 states, yielding national estimates of hospital inpatient stays in children. HCUP inpatient data are based on administrative data and discharge abstracts created by hospitals for billing. The KID is a sample of pediatric discharges from hospitals in states participating in HCUP. Pediatric

HCUP	Healthcare Cost and Utilization Project
ICD-9-CM	*International Classification of Diseases, 9th edition, Clinical Modification*
KID	Kids' Inpatient Database

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discharges are defined as all discharges where the patient was ≤20 years of age at admission.

The KID is available every 3 years. For this study we accessed the data for the years 2006, 2009, and 2012, the latest years available in the database. These 3 years were queried for patients with a principal diagnosis of acute pancreatitis. Patient data stratified by age were recorded for sex, race, insurance, hospital type and size, procedures, imaging, duration of stay, cost of admission, and comorbid conditions, among other data, and were analyzed. Duration of stay was defined as the duration of hospital stay in days. Data in the KID were extracted using *International Classification of Diseases, 9th edition, Clinical Modification* (ICD-9-CM) codes. ICD-9-CM codes used for chronic pancreatitis, endoscopic retrograde cholangiopancreatography, ultrasound imaging, computed tomography of the abdomen, parenteral nutrition, gallstone and biliary pancreatitis, triglyceridemia/lipidemia, trauma, viral, pancreas divisum and other anomalies, obesity, and overweight are listed in **Table I** (available at www.jpeds.com). Cases were grouped as per the following classification: young age cohort (preschool; <5 years of age), middle age cohort (school age; 5-14 years of age), and adolescents (>14 years of age) on admission. The classification was based on the limited number of previous studies available and the authors' experience.

The Ohio State University Data and Specimen Policy and Human Subjects Research policy does not require Institutional Review Board approval for population-based public dataset. Per 45 Code of Federal Regulations (CFR 46.101), research using certain publicly available datasets does not involve "human subjects." The data contained within these specific datasets are neither identifiable nor private and thus do not meet the federal definition of "human subject" as defined in 45 CFR 46.102. Therefore, these research projects do not need to be reviewed and approved by the institutional review board.

Statistical Analyses

Means and 95% CI or medians and IQR were calculated for continuous variables, as appropriate, and frequency counts and percentages were used to summarize categorical variables. Continuous variables were tested for statistical significance using ANOVA and categorical variables were analyzed with χ^2 tests. Temporal trends were assessed using the Cochrane–Armitage trend test. To analyze predictors of changes in trends of acute pancreatitis-related admissions, all admissions for any reason were included. A multivariate logistic regression model containing patient and hospital demographics in addition to discharge year was fit for a primary diagnosis of acute pancreatitis. Interactions between discharge year and obesity and chronic pancreatitis were evaluated. All analyses were performed on weighted data using survey procedures to produce national estimates. A P value < .05 was considered statistically significant. Statistical analysis was performed with SAS, version 9.4, (SAS Institute, Cary, North Carolina).

Results

There were 28 288 total discharges in 2006, 2009, and 2012 with a primary diagnosis of acute pancreatitis; of these a total of 27 983 discharges had available patient age data. Demographic data are shown in **Table II** (available at www.jpeds.com).

The number of admissions increased with age: preschoolers (n = 1279), school age (n = 8012), and adolescents (n = 18 692). There were more female patients in each of the groups at 53.9%, 53.9%, and 61.3%, respectively (**Table III**). Preschool children were more likely to be admitted to urban teaching hospitals—84.3%, 74.1%, and 48.7%, respectively, in preschool, school-age, and adolescent groups, respectively (P < .001). Of patients from all age groups, 60%-63% were admitted to large hospitals (**Table III**).

Older patients were more likely to undergo endoscopic retrograde cholangiopancreatography compared with the younger age groups during admissions; 10.9% in the adolescent group, 6.2% in the school-age group, and 6.3% in the preschool group (P < .001). There were no differences among age groups in associated imaging studies including ultrasound examinations or computed tomography scans of the abdomen. Parenteral nutrition was more frequently used in preschool children (15.5%) compared with 10% in those between 5 and14 years of age and 4.9% in those older than 14 years of age (P < .001) (**Table IV**).

Preschool patients were discharged to home health care in 5.6% of the cases vs 2.7% in those 5-14 years of age, and 1.8% in those >14 years of age. Death was a rare event in pediatric acute pancreatitis and occurred in 0.12%-0.24% in all age groups (**Table IV**).

Duration of stay was greatest in the younger group, the preschool children (median, 3.47 days; IQR, 2.01-7.35), compared with those in the middle age group (median, 3.22 days; IQR, 1.81-5.63), and older children (median, 2.87 days; IQR-1.61, 4.81; P < .001). Cost of hospitalization varied with age: $6726 in the preschool group, $5400 in the school-age group, and $5889 in adolescents ($P$ < .001) (**Table IV**).

Comorbid conditions varied in distribution between the age groups. In general, diabetes, hypertension, depression, drug abuse, and psychosis increased with age (P < .05) (**Table V**; available at www.jpeds.com).

Known etiologies and risk factors for acute pancreatitis were analyzed by age groups. The presence of alcohol, gallstones/biliary etiologies, and hypertriglyceridemia were more common among older children compared with younger children (P < .001). Pancreas divisum and other pancreatic anomalies were not significantly different between the groups (**Table VI**).

There was a significant increasing trend in acute pancreatitis from 2006 to 2012 (P < .001). Secondary diagnoses (as coded in the KID database) of obesity and chronic pancreatitis showed significant increasing trends as well (P < .001). Stratified by age groups, trends of the secondary diagnoses of obesity and chronic pancreatitis were significant only in the school age and older age groups, but not in the young age groups (**Figure**).