

# Emergency Department Visits for Acute Pancreatitis in Children: Results From the Nationwide Emergency Department Sample 2006–2011

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**Objective:** The objective of this study was to describe the epidemiology and trends in pediatric acute pancreatitis (AP)-associated emergency department (ED) visits in the United States.

**Methods:** Estimates of AP-associated ED visits were calculated in children from birth to 19 years of age using the Nationwide Emergency Department Sample.

**Results:** From 2006 to 2011, there were an estimated total of 78,787 ED visits associated with the diagnosis of AP. The greatest number of ED visits occurred in children 15 to 19 years of age (67.0%). A majority of patients were subsequently admitted to the hospital for further care (74.1%). Risk factors independently associated with an increased rate of hospital admission included 3 or more comorbid conditions (adjusted odds ratio [aOR] 12.81; 95% confidence interval [CI], 11.29–14.56), children younger than 5 years (aOR, 1.73; 95% CI, 1.58–1.89), presentation to a teaching hospital (aOR, 1.68; 95% CI, 1.62–1.74) or a hospital in the Western region of the United States (aOR, 1.48; 95% CI, 1.42–1.54), and health coverage with Medicaid (aOR, 1.23; 95% CI, 1.17–1.29). Acute pancreatitis-associated ED visits increased from 14.5 per 100,000 children in 2006 to 16.1 per 100,000 children in 2011 (11.42% increase;  $P < 0.01$ ).

**Conclusion:** There has been an increasing incidence of AP-associated ED visits in children from 2006 to 2011.

**Key Words:** acute pancreatitis, children, National Emergency Department Sample, pediatric

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Several single-center studies have demonstrated a rising number of pediatric cases of acute pancreatitis (AP), both globally and in the United States.<sup>1–6</sup> Recently, we utilized nationwide data to demonstrate that from 2000 to 2009, the incidence of AP in hospitalized children in the United States increased in excess of 50%.<sup>7</sup>

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Unfortunately, our knowledge regarding the epidemiology of pediatric AP remains limited. Specifically, little is known regarding the presentation of children with this condition to the emergency department (ED). Therefore, the aim of this study was to interrogate a national US database in order to better understand the utilization of ED resources by children with AP.

## METHODS

### Data Source

We used the Healthcare Cost and Utilization Project Nationwide Emergency Department Sample (HCUP-NEDS) years 2006–2011 for our study. The NEDS is the largest all-payer ED database in the United States and provides national estimates of hospital-based ED visits. The 2011 HCUP-NEDS comprises approximately 29.5 million ED visits sampled from 951 hospitals in 30 US states representing a 20% stratified sample of US hospital-based EDs. Weights are provided to calculate national estimates pertaining to approximately 131 million ED visits in 2011. The NEDS contains event-level records, not patient-level records; individual patients who visit the ED more than once in a year are recorded in the NEDS each time. Each ED visit entry contains 1 primary discharge diagnosis, 1 to 14 secondary diagnoses (based on the *International Classification of Diseases, Ninth Revision, Clinical Modification* [ICD-9-CM] diagnosis codes), demographic information, and details of disposition from the ED.

### Variable Definition

Our study included children from birth up to 19 years of age. We extracted all entries with a primary or secondary discharge diagnosis of AP (ICD-9-CM code: 577.0). This is the sole code for AP, and it has been used previously to identify AP cases in children.<sup>2</sup> Details regarding age, sex, insurance status, geographic location of care, and hospital setting were also obtained for the extracted cases.

Previously, we reported on the association of various medical conditions that occurred frequently in the setting of pediatric AP.<sup>7</sup> In multivariable logistic regression analyses, comorbid conditions that were highly associated with pediatric AP included, in descending order, liver/biliary disease, inflammatory bowel disease, diabetes mellitus, fluid and electrolyte disorders, trauma, sepsis, HIV infection, and renal disease. Using earlier described methods,<sup>7</sup> we utilized appropriate ICD-9-CM codes to query for the presence of these and other disease conditions in our current study population.

Also, in order to assess independent risk factors associated with ED-directed hospital admissions, we assessed and adjusted for the presence of comorbidities in our study population using a more formal scoring system; the Elixhauser comorbidity index.<sup>8</sup> This is a widely used index in which higher scores indicate a greater comorbid disease burden.<sup>9,10</sup>

## Statistical Analysis

Statistical analyses were performed using SAS version 9.3 (SAS Institute, Cary, NC). The rate of AP-associated ED visits was expressed per 100,000 census population, thereby adjusting for the change in the US pediatric population over time. Data were obtained from the US Census Bureau, Population Division, Annual Estimates of the Population for the United States, Regions, and Divisions and US Census Bureau, Current Population Reports. A  $\chi^2$  test was used to compare categorical variables, and the 2-proportion Z test was used to compare rates. Univariate and multivariable logistic regression models were used to study the association of selected variables of interest with the outcome of admission to the hospital from the ED. For trend analysis, we used the Cochran-Armitage test. The threshold for significance for all analyses was  $P < 0.01$ .

Given that the HCUP-NEDS database does not contain any identifiable patient health information, our study was considered exempt from institutional review board review.

## RESULTS

During the years 2006–2011, there were an estimated total of 78,787 ED visits associated with an ICD-9-CM diagnosis code of AP. Table 1 details the demographic- and hospital-related characteristics of this patient population. The median age of patients was 16 years (interquartile range, 13–18 years). The greatest number of visits occurred in children 15 to 19 years of age (67.0%; 95% confidence interval [CI], 66.67%–67.33%) followed by children 10 to 14 years of age (18.4%; 18.13%–18.67%). Children 0–4 years of age accounted for a very small percentage of total AP cases (5.2%; 95% CI, 5.04%–5.36%). There was a significant preponderance of female patients: 61.2% compared with 38.8% male patients ( $P < 0.01$ ). The southern region of the United States accounted for 34.7% of all AP-associated ED visits. Visits to teaching hospitals were slightly more frequent than nonteaching hospitals (50.9% vs 49.1%;  $P < 0.01$ ) and ED facilities were predominantly located in metropolitan areas (72.9%). Most patients carried either private insurance (42.8%) or Medicaid (43.2%). A little less than half (45.4%) of the children in our study suffered at least 1 other medical comorbidity. The observed comorbidities included, in descending order of frequency, fluid and electrolyte disturbances (18.4%), cardiopulmonary disorders (14.5%), obesity (6.6%), and diabetes mellitus (6.5%).

In querying for medical conditions known to be associated with AP, we observed that the 3 most frequently associated disorders were the presence of fluid and electrolyte disturbances (28.80%), liver/biliary disease (27.90%), and substance abuse (9.70%).

In determining the disposition of patients from the ED, we noted that a majority of children were either admitted for further care to the same hospital (66.6%) or transferred to another short-term hospital (7.5%). Few patients (23.4%) underwent routine discharge (discharged to home with self-care). Using multivariable logistic regression, we identified risk factors that were associated with an increased rate of hospital admission for AP. Major risk factors included the presence of 3 or more comorbid conditions (adjusted odds ratio [aOR] 12.81; 95% CI, 11.29–14.56), children younger than 5 years (aOR, 1.73; 95% CI, 1.58–1.89), presentation to a teaching hospital (aOR, 1.68; 95% CI, 1.62–1.74), presentation to a hospital in Western region of the United States (aOR, 1.48; 95% CI, 1.42–1.54), and health coverage with Medicaid (aOR, 1.23; 95% CI, 1.17–1.29).

An analysis of temporal trends during the period of our study demonstrated that AP-associated ED visits increased from 14.46 per 100,000 children in 2006 to 16.11 per 100,000 children in 2011 (table 2). This represented an increase of 11.42% with an

overall increasing trend ( $P < 0.01$ ). Specifically, the greatest rate of increase was for AP in children aged 10 to 14 years (20.78%)

## DISCUSSION

Our study of the NEDS database regarding AP-associated pediatric ED visits provides valuable complementary information regarding the epidemiology of this disease in the United States. The overall demographic characteristics of children who presented to the ED with AP closely paralleled a previously studied pediatric inpatient cohort with a discharge diagnosis of AP.<sup>7</sup> Notably, AP-related ED visits occurred most frequently in older children with a female preponderance. This is likely due to the increased occurrence of specific medical conditions closely associated with AP in older, female patients such as gallstone disease.

A large number of children with AP had associated comorbidities. On further analysis, the most frequent of these (~18%)

**TABLE 1.** Demographic- and Hospital-Related Characteristics of Patients 0 to 19 Years of Age With a Primary or Secondary Discharge Diagnosis of AP Who Visited an ED in the United States from 2006 to 2011

Characteristic	
Age, y	
Median (IQR)	16 (13–18)
Gender*	
Male	38.80%
Female	61.20%
Age group, * y	
0–4	5.20%
5–9	9.40%
10–14	18.40%
15–19	67.00%
Insurance status*	
Private	42.80%
Medicaid	43.20%
No insurance	13.90%
Geographic region*	
Northeast	15.20%
Midwest	20.70%
South	34.70%
West	29.40%
Hospital designation*	
Metro	72.90%
Non-Metro	27.10%
Hospital teaching status*	
Teaching	49.10%
Nonteaching	50.90%
No. comorbidities*	
0	54.50%
1	25.20%
2	12.10%
≥3	8.10%
Disposition from the ED*	
Routine	23.40%
Admitted to same hospital	66.60%
Transferred to another hospital	7.50%

\*Significant difference between variables  $P < 0.01$ .

Data from HCUP-NEDS.

TABLE 2. AP-Associated ED Visits by Age\*

Age Group	2006	2007	2008	2009	2010	2011	% Change
<5 y	3.56	3.37	3.8	3.31	2.72	3.68	3.39
5–9 y	5.97	6.58	7.53	5.38	5.18	6.35	6.5
10–14 y	9.89	11.62	13.3	12.18	10.69	11.95	20.78
15–19 y	36.45	38.25	41.81	40.77	42.11	40.82	12
Total	14.46	15.52	17.22	16	15.7	16.11	11.42

\*Rates adjusted and expressed as per 100,000 children for a given calendar year utilizing US Census data.

Data from HCUP-NEDS.

was the presence of fluid and electrolyte disturbances, which are well-recognized complications of the disease. However, a significant proportion of our cohort also had cardiopulmonary disorders (~14%), obesity (~6%), and diabetes mellitus (~6%). Also, while querying for specific medical disorders known to be associated with pediatric AP, liver and biliary disease continued to be highly associated conditions. Of significant concern, we observed that almost 10% children with AP suffered from drug or alcohol abuse.

While the majority of children with AP-related ED visits were admitted for further inpatient care, a sizeable proportion (~23%) were discharged to home. Not surprisingly, the presence of a greater comorbid burden and younger age were the leading factors associated with the decision to admit the child to the hospital. However, presentation to a teaching versus a nonteaching hospital also appeared to be a significant factor in this regard. Presentation to a teaching hospital as a risk factor for admission may be reflective of a selection bias because it is probable that children with a more severe degree of AP and with a greater number of comorbidities were directed to teaching institutions.

The population-adjusted rate of AP-associated ED visits increased significantly from 2006 to 2011. This was especially true of the 10- to 14-year-old age group of children, among which the rate increased by almost 21%. However, this is still substantially less than the 58% increase in AP cases reported in hospitalized children in the United States from 2000 to 2009.<sup>7</sup> We are of the opinion that the number of pediatric AP cases may have recently stabilized. Unfortunately, there are no recent studies on the national prevalence of pediatric AP to directly address this issue.

### LIMITATIONS

There are several limitations to our study. First, we relied exclusively on ICD-9-CM codes for case identification. Second, the NEDS has limited clinical and demographic data, which limits our ability to investigate disease etiology. Furthermore, we could not determine the clinical severity of AP using traditional parameters such as the presence of shock, multiorgan failure, need for transfusion of blood products, the requirement for intensive care monitoring, or the use of cardiopulmonary support including vasopressors and mechanical ventilation. Third, the interpretation of our results remains limited to children in the United States. Finally, our results represent a weighted estimate of national data. While estimates from the HCUP family of databases have been demonstrated to be in close agreement to similar sources such as the National Hospital Discharge Survey, this could be a potential source of error.

### CONCLUSIONS

Pediatric AP-related ED visits increased significantly from the period 2006–2011. However, the rate of increase is

substantially less than the rate of hospital discharges of pediatric AP cases from 2000 to 2009. This poses the important question whether the incidence of pediatric AP has stabilized in recent years. As more recent data become available, this should be the focus of further investigation. Future studies should also investigate the clinical characteristics and outcomes in children with AP who were discharged from the ED and the occurrence of alcohol-related AP in the pediatric-age group.

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