

# Characteristics and Outcomes of Pediatric Heart Failure-Related Emergency Department Visits in the United States: A Population-Based Study

Erika J. Mejia, MD<sup>1</sup>, Matthew J. O'Connor, MD<sup>1,2</sup>, Kimberly Y. Lin, MD<sup>1,2</sup>, Lihai Song, MS<sup>1</sup>, Heather Griffis, PhD<sup>1</sup>, Christopher E. Mascio, MD<sup>1,2</sup>, Pirouz Shamszad, MD<sup>1,2</sup>, Aaron Donoghue, MD, MSCE<sup>1</sup>, Chitra Ravishankar, MD<sup>1,2</sup>, Robert E. Shaddy, MD<sup>4</sup>, and Joseph W. Rossano, MD, MS<sup>1,2,3</sup>

**Objectives** To describe the frequency, characteristics, and outcomes of heart failure-related emergency department (ED) visits in pediatric patients. We aimed to test the hypothesis that these visits are associated with higher admission rates, mortality, and resource utilization.

**Study design** A retrospective analysis of the Nationwide Emergency Department Sample for 2010 of patients ≤18 years of age was performed to describe ED visits with and without heart failure. Cases were identified using *International Classification of Disease, Ninth Revision, Clinical Modification* codes and assessed for factors associated with admission, mortality, and resource utilization.

**Results** Among 28.6 million pediatric visits to the ED, there were 5971 (0.02%) heart failure-related cases. Heart failure-related ED patients were significantly more likely to be admitted (59.8% vs 4.01%; OR 35.3, 95% CI 31.5-39.7). Among heart failure-related visits, admission was more common in patients with congenital heart disease (OR 5.0, 95% CI 3.3-7.4) and in those with comorbidities including respiratory failure (OR 78.3, 95% CI 10.4-591) and renal failure (OR 7.9, 95% CI 1.7-36.3). Heart failure-related cases admitted to the hospital had a higher likelihood of death than nonheart failure-related cases (5.9% vs 0.32%,  $P < .001$ ). Factors associated with mortality included respiratory failure (OR 4.5, 95% CI 2.2-9.2) and renal failure (OR 7.8, 95% CI 2.9-20.7). Heart failure-related ED visits were more expensive than nonheart failure-related ED visits (\$1460 [IQR \$861-2038] vs \$778 [IQR \$442-1375] [ $P < .01$ ].)

**Conclusions** Heart failure-related visits represent a minority of pediatric ED visits but are associated with increased hospital admission and resource utilization. (*J Pediatr* 2017;■■:■■-■■).

**H** heart failure in children is associated with significant morbidity, mortality, and cost. Children admitted to the hospital with heart failure have an over 20-fold increase in the risk of death compared with children without heart failure, and when heart failure is associated with comorbidities such as renal failure or the need for extracorporeal membrane oxygenation, hospital mortality can range from 35%-50%.<sup>1</sup> When comparing trends in heart failure morbidity and mortality, the pediatric population fares worse than adults with heart failure. Although mortality has decreased in both populations, it is consistently higher among children, especially in infants than adults. In addition, hospital charges for pediatric patients with cardiomyopathy and heart failure are nearly 3 times that of adults, and the difference in cost continues to grow.<sup>2</sup>

Emergency department (ED) visits for pediatric patients with heart failure have been poorly characterized in current literature, however, many patients with heart failure will present to the ED at some point in their clinical course. Among adults, there are over 800 000 heart failure-related ED visits annually, with 74%-84% of these visits leading to admission.<sup>3,4</sup> However, there is a paucity of data regarding pediatric heart failure-related ED visits, and none that provide a population-based assessment.<sup>5,6</sup> Therefore, the purpose of our study was to describe nationwide estimates of total pediatric heart failure-related ED visits and test the hypothesis that comorbidities would be associated with hospital admission, mortality, and resource utilization.

From the <sup>1</sup>Department of Pediatrics, Children's Hospital of Philadelphia; <sup>2</sup>Perman School of Medicine at the University of Pennsylvania; <sup>3</sup>Leonard Davis Institute of Health Economics, The University of Pennsylvania, Philadelphia, PA; and <sup>4</sup>Keck School of Medicine, University of Southern California, Los Angeles, CA

The authors declare no conflicts of interest.

A portion of this study was presented as a poster at the American Academy of Pediatrics National Conference, October 24-25, 2015, Washington, DC, and at the Children's Hospital of Philadelphia (CHOP) Cardiology Conference, February 24-28, 2016, Orlando, Florida.

0022-3476/\$ - see front matter. © 2017 Elsevier Inc. All rights reserved.

<https://doi.org/10.1016/j.jpeds.2017.10.009>

CHD	Congenital heart disease
ED	Emergency department
HCUP	Healthcare Cost and Utilization Project
ICD-9-CM	<i>International Classification of Disease, Ninth Revision, Clinical Modification</i>
NEDS	Nationwide Emergency Department Sample

## Methods

A retrospective analysis of the 2010 Nationwide Emergency Department Sample (NEDS), Healthcare Cost and Utilization Project, and Agency for Healthcare Research and Quality was performed.<sup>7</sup> This database is a sample of the State Inpatient Database and the State Emergency Department Database, which are part the Healthcare Cost and Utilization Project (HCUP). HCUP is a group of publicly available databases sponsored by the Agency for Healthcare Research and Quality. The State Inpatient Database represents nearly 97% of all community hospital discharges across 48 states and captures information regarding patients initially seen in the hospital and then discharged. The State Emergency Department Database is a compilation of data from 31 states of patients cared for in the ED and then discharged. NEDS contains 28.5 million ED visits in 961 hospitals across 28 states. It uses a 20% stratified sample of hospitals in the US and is, therefore, a representation of the diversity of hospitals across the country. It stratifies hospitals according to US census region, trauma center designation, urban-rural location of the hospital, ownership, and teaching.<sup>8</sup> NEDS is the largest all payer ED database. It includes up to 15 *International Classification of Disease, Ninth Revision, Clinical Modification* (ICD-9-CM) codes with each encounter, as well as over 100 clinical and nonclinical variables, including diagnoses, procedures, income quartile, and total charges.<sup>7,8</sup> It has been previously used to make national estimates regarding ED visits.<sup>9-12</sup> The Agency for Healthcare Research and Quality and HCUP carry out several data checks and edits to ensure the quality of the databases.<sup>13</sup> The study population included pediatric cases ( $\leq 18$  years of age). Cases with heart failure and other comorbidities were identified using ICD-9-CM codes (**Table I**; available at [www.jpeds.com](http://www.jpeds.com)).

The 3 primary outcomes of interest were admission, mortality during hospitalization, and the total amount the hospital billed for during the ED and/or inpatient visit (total charge for ED and inpatient).

Demographic information included age, sex, payer type, region, and hospital urban-rural designation. Several comorbidities were flagged, which include arrhythmia, cardiomyopathy, myocarditis, pulmonary hypertension, congenital heart disease (CHD), hepatic impairment, renal failure, respiratory failure, and sepsis. These diagnoses were identified using ICD-9-CM codes, respectively, and were selected for study based on previous published work.<sup>1,14,15</sup>

## Statistical Analyses

All analyses were performed with SAS v 9.3 (SAS Institute, Cary, NC) or SPSS v 22 (IBM Corporation, Armonk, NY). Descriptive analyses were reported across 3 pediatric ED case groups: all cases that were identified with heart failure and admitted to the hospital and cases that were identified with heart failure and discharged from the ED. In addition, descriptive statistics were reported comparing characteristics of admitted cases who died and who were discharged alive. We developed separate multivariable logistic regression models assessing heart failure patient characteristics associated with

admission from the ED and those characteristics associated with mortality of admitted heart failure patients. We used Rao-Scott  $\chi^2$  tests (which is a modified version of the Pearson  $\chi^2$  test which accounts for the complex survey design) and Wald test. Per the guidelines of HCUP, the variable “discharge weight” was employed during statistical analysis to provide a national estimate.<sup>8</sup> Cost was calculated as the total amount billed for the ED/inpatient visit. ORs and associated 95% CIs are reported. Statistical significance was defined as  $P < .05$ .

## Results

Among an estimated 28.6 million national pediatric visits to the ED, there were 5971 (0.02% [95% CI 5641-6301]) heart failure-related visits. Compared with nonheart failure-related patients, heart failure-related patients were younger (median age 2 [IQR 0-13] vs 6 [IQR 2-14] years old;  $P < .01$ ). Common cardiac diagnoses among patients with heart failure-related ED visits included CHD (43.1%), arrhythmias (14.3%), cardiomyopathy (13.7%), and pulmonary hypertension (11.7%) (**Table II**). Compared with nonheart failure-related ED visits, patients with heart failure-related ED visits had higher proportions of comorbidities such as pneumonia (14.8% vs 2.1%), acute bronchitis (5.8% vs 2.4%), asthma (8.8% vs 6.9%), and gastrointestinal infection (2.7% vs 0.6%) (all  $P < .001$ ). A higher proportion of heart failure-related ED visits were public (Medicare/Medicaid) beneficiaries (64.2 [95% CI 61.5-66.9] vs 50.64 [95% CI 50.61-50.68];  $P < .001$ ).

When comparing all heart failure-related ED and nonheart failure-related ED visits, heart failure-related ED visits were more expensive (\$1460 [IQR \$861-2038] vs \$778 [IQR \$442-1375];  $P < .01$ ). Among patients who were not admitted, heart failure-related ED visits had greater than double the charges generated compared with nonheart failure-related ED visits (median cost \$1603.6 [IQR 734.5-2771.6] vs \$765.1 [IQR 431.4-1342.7];  $P < .001$ ). This difference is also observed between heart failure-related and nonheart failure-related patients admitted to the hospital (\$1388.4 [IQR 928.1-1652.4] vs 1179.4 [IQR 761.9-928.1]  $P < .001$ ). Heart failure-related ED patients who were discharged incurred a greater ED charge than admitted heart failure-related visits (\$1603.60 [IQR 734.50-2771.6] vs \$1388.4 [IQR 928.1-1652.4];  $P < .001$ ). In a post-hoc analysis of our data comparing the cost of heart failure-related ED visits with other chronic illnesses, heart failure-related visits incurred greater charges than cystic fibrosis; however, patients with leukemia had slightly higher charges (**Table III**; available at [www.jpeds.com](http://www.jpeds.com)).

Heart failure-related ED visits were more likely than nonheart failure-related visits to result in hospital admission. Of the estimated 5971 heart failure-related ED visits, 3568 were admitted to the hospital they presented to initially, which is a significantly higher proportion of admission than that seen in nonheart failure-related ED visits (59.8% [95% CI 56.98-62.5] vs 4.03% [95% CI 4.01-4.05], OR 35.3, 95% CI 31.5-39.7). An additional 9.0% (95% CI 7.3-10.7%) of heart failure-related ED patients were transferred to another

Download English Version:

<https://daneshyari.com/en/article/8812572>

Download Persian Version:

<https://daneshyari.com/article/8812572>

[Daneshyari.com](https://daneshyari.com)