

ORIGINAL RESEARCH

Pediatrics

Comparing definitions of a pediatric emergency department

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Abstract

Objective: Health services research on the differences in care between pediatric and general emergency departments (EDs) is limited by ambiguity regarding the definition of a pediatric ED. Our goal was to determine the proportion of EDs captured by commonly used definitions of pediatric ED.

Methods: We linked data for 2016 from two databases from New York State – the State Emergency Department Database and State Inpatient Database (SEDD/SID) and the National Emergency Department Inventory-USA (NEDI-USA). We examined the following 4 common definitions of pediatric ED: (1) admission capability, (2) physically distinct pediatric area in the ED, (3) membership in the Children's Hospital Association, and (4) volume of pediatric ED visits (patients <18 years). We calculated the proportion of EDs that would be defined as pediatric for each criterion. We also examined the differences in patient demographics among pediatric EDs based on each criterion.

Results: A total of 160 New York EDs were included in the linked databases. Across the 4 criteria, the proportion of EDs meeting the definition of *pediatric* ranged from 0% to 86%. Of the EDs, 86% had pediatric admission capability, 27%–38% had a physically distinct pediatric ED, and 8% were members of the Children's Hospital Association. No hospitals met the SEDD/SID criterion of $\geq 70\%$ visits for patients <18 years.

Discussion: The number of EDs and characteristics of patients seen varied widely based on the criterion used to define pediatric ED. Database linkage may make it challenging to identify pediatric hospitals in administrative data sets. A valid, standard definition of pediatric ED is critically needed to advance health services research.

KEYWORDS

children's hospital, emergency medicine, health policy

1 | INTRODUCTION

1.1 | Background

The vast majority of emergency care for children is provided in general emergency departments (EDs) rather than specialty pediatric

EDs.¹ Studies have demonstrated significant differences in quality and outcomes between general and pediatric EDs.^{2,3} For example, pediatric patients receiving care in general EDs are less likely to receive guideline-concordant asthma care⁴ and are more likely to receive computed tomography scans in the evaluation of abdominal pain² and higher doses of radiation.⁵ Understanding differences

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in quality and outcomes between general and pediatric EDs is critically important for improving emergency care to children in all settings.

Much of health services research involves the use of large administrative data sets, for example, the State Emergency Department Databases from the Agency for Healthcare Research and Quality (AHRQ). For health services research comparing care or outcomes between pediatric and general EDs, an accurate, valid definition of *pediatric* ED is essential. Existing definitions of pediatric ED, however, are highly varied. Studies have defined pediatric ED based on self-report within a health system² or presence of a separate pediatric area.⁶ Others have used volume-based cutoffs (eg, >75% pediatric visits)³ or the Children's Hospital Association (CHA) list of pediatric facilities.⁵ A recent study used data from the America Hospital Association (AHA) survey on self-reported pediatric services⁷ to determine the categorization of pediatric and nonpediatric hospitals.

1.2 | Importance

Overall, the degree of variation in the definition of pediatric ED critically limits the validity of health services research in pediatric emergency medicine. Without a valid definition, we cannot compare results across studies nor can we identify the critical characteristics that are associated with better care. Moreover, the AHA assigns identifiers to hospitals/hospital systems that are often used to link databases for health services research.^{8,9} Understanding how emergency care for children is captured in linked databases is critically important for researchers planning to investigate pediatric care and outcomes in administrative data.

1.3 | Goals of this investigation

The objective of the current study was to determine how often a given ED would be labeled *pediatric* using the most common definitions used in health services research.

2 | METHODS

2.1 | Study design, setting, and data collection

We conducted a cross-sectional study using linked data from 2 administrative databases: the the AHRQ's New York State Emergency Department Database and State Inpatient Database (SEDD/SID) and the National Emergency Department Inventory–USA (NEDI).¹⁰ Data collection methods for AHRQ data¹¹ and NEDI¹² have been previously described. We included data from the calendar year 2016. The Partners Healthcare Human Research Committee reviewed this project and classified it as exempt.

The Bottom Line

An accurate definition of pediatric emergency department (ED) is a major limitation in health services research. In this study of data linked from 2 large administrative data sets, there was wide and striking variation in the number of EDs in New York State that qualified as pediatric based on 4 commonly used criteria.

2.2 | Administrative databases

We created a combined SEDD/SID–NEDI database using SEDD/SID for data on patient visits and NEDI for data on hospital characteristics (eg, dedicated pediatric waiting room). SEDD/SID has 3 hospital identifiers: the data source identifier (DSHOSPID), the AHA identifier (AHAID) for database linkage, and a unique Healthcare Cost and Utilization Project hospital identifier (HOSPID). HOSPID and AHAID have a 1-to-1 match in the New York data. NEDI also includes the AHAID for database linkage. Thus, we used the unique hospital AHAID to link SEDD/SID data with NEDI data.¹³

The AHA often groups EDs by hospital network so that data in SEDD–SID may represent multiple EDs, while NEDI lists all EDs individually. We used a previously developed matching algorithm for consolidating ED-specific NEDI data into observations for linkage with the AHA-based data sets.¹³ When more than 1 NEDI ED was matched to a single AHAID, data were consolidated into 1 observation using sums or weighted averages of responses as previously described.

2.3 | Outcomes

We examined the following 4 definitions of pediatric ED: (1) pediatric admission capability,⁷ (2) physically distinct pediatric area in the ED,⁶ (3) membership in the CHA,¹⁴ and (4) volume of pediatric ED visits.³ For pediatric admission capability, we collected data on both pediatric bed availability as measured by the AHA survey and the presence of inpatient care for children as identified by SID pediatric admissions. For physically distinct pediatric area in the ED, the AHA defines it as a hospital ED capable of stabilization and management of pediatric patients including transfer to a definitive care facility. In contrast, NEDI defines it as any dedicated physical ED area for children, including EDs with only a pediatric waiting room but shared adult and pediatric treatment space. For volume of pediatric visits, we defined pediatric as $\geq 70\%$ ED visits by pediatric population (defined as <18 years of age in SEDD/SID data or using ED specific pediatric cut-off in NEDI).

2.4 | Analysis

We calculated what proportion of EDs would be considered pediatric for each of the 4 definitions. We then examined the differences in the

TABLE 1 Number of emergency departments (EDs) captured by each definition of a pediatric ED, among a total of 160 EDs in New York state

Category	Definition	Data source	EDs meeting definition, n (%)
Admission	AHA pediatric bed availability	AHA	77 (48)
	SID pediatric admissions	SID	138 (86)
Separate pediatric care area	AHA separate pediatric area	AHA	60 (38)
	NEDI separate pediatric area	NEDI	43 (27)
Membership	CHA membership	CHA	13 (8)
Volume	SEDD/SID $\geq 70\%$ visits of patients <18 years of age (after linkage)	SEDD/SID	0 (0)
	NEDI $\geq 70\%$ visits defined as pediatric (generally patients <18 years of age)	NEDI	3 (2) ^a

AHA, American Hospital Association; CHA, Children's Hospital Association; ED, emergency department; NEDI, National Emergency Department Inventory-USA; SEDD/SID, State Emergency Department Databases and State Inpatient Databases.

^aFrom NEDI alone (not grouped by AHA identifiers for SEDD/SID merger).

number and demographics of visits that would be attributed to a pediatric ED.

3 | RESULTS

3.1 | Inclusion

There were 160 New York State EDs included in the combined/linked data set. EDs missing AHAIIDs in SEDD or that were not included in the NEDI database were excluded.

3.2 | Main outcomes

Across the 4 definitions, the proportion of EDs meeting criteria in the linked database ranged from 0 to 86% (Table 1). A definition based on admission capability was met by 86% of EDs. Between 27% and 38% of EDs reported a physically distinct pediatric ED area (depending on the data source), and 8% were members of the CHA (Figure 1).

Before database linkage, using only the individual hospital identifiers in the SEDD/SID, 3 hospitals had more than 70% pediatric ED visits. However, using the AHAIID in SEDD/SID (as would be required for database linkage in future studies), no hospitals met the 70%

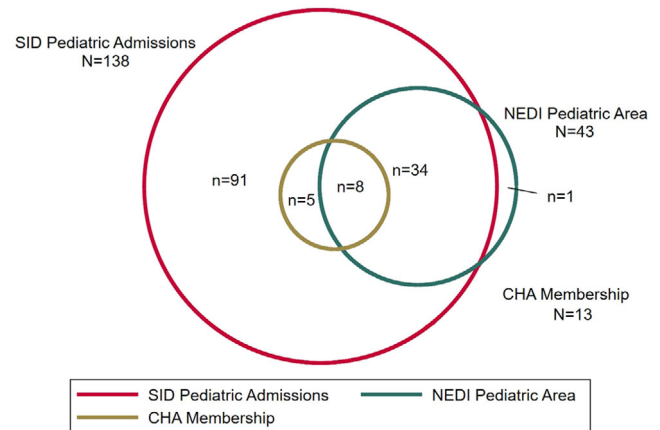


FIGURE 1 Number of emergency departments identified as pediatric by definition of pediatric ED, New York State 2016. Each circle represents a potential definition of a pediatric ED and shows the number of EDs that would be included within that definition; overlapping circles show EDs that would have qualified as a pediatric ED under more than 1 definition. CHA, Children's Hospital Association; NEDI, National Emergency Department Inventory-USA; SID, State Inpatient Databases

cutoff for pediatric visits. Similarly, before linkage, 3 (2%) hospitals reported to NEDI that $\geq 70\%$ visits were defined as pediatric. Thus, once the merged database was created, no hospitals met the SEDD/SID criteria of $\geq 70\%$ visits of patients <18 years of age in the merged SEDD/SID/NEDI database.

3.3 | Patient visits and characteristics by pediatric ED definition

Using the merged SEDD/SID and NEDI data set, the range of ED visits by children that would be attributed to a pediatric ED ranged from 30% to 97% depending on the definition of pediatric ED used. Using pediatric bed availability, the proportion of visits was 78% (AHA). Applying the SID pediatric admission definition in the merged database captured 97% of pediatric ED visits. Based on having a separate pediatric area, the proportions were 73% (AHA) and 60% (NEDI). Only 30% of pediatric visits would have been attributed to a pediatric ED using the CHA membership definition (Table 2).

The patient characteristics also differed depending on the definition used (Table 2). The proportion of visits by infants (<1 year) that were seen in a pediatric ED were fairly consistent depending on the definition used. Visits by infants comprised 12% of ED visits from pediatric EDs based on admission capability and 13%–14% of ED visits using other definitions. The percentages for children of other ages also remained relatively stable across definitions. The proportion of visits by Black, Hispanic, and White children attributed to a pediatric ED were less stable across definitions (Table 2). Among ED visits by non-Hispanic Black children in our cohort, the range of visits that would be attributed to a pediatric ED was 18%–28% of ED visits, for Hispanic children it was 23%–32%, and for non-Hispanic White children

TABLE 2 Demographics of children presenting to a pediatric ED, for each pediatric ED definition^a

	AHA pediatric bed availability, n (%)	SID pediatric admissions, n (%)	AHA separate pediatric area, n (%)	NEDI separate pediatric area, n (%)	CHA membership, n (%)	Total, N (%)
Overall	1,192,215 (78)	1,488,243 (97)	1,111,176 (73)	911,878 (60)	453,793 (30)	1,528,133
Age, years						
<1, infant	146,844 (12)	174,167 (12)	138,976 (13)	114,239 (13)	62,047 (14)	176,425 (12)
1–11.9	745,693 (63)	920,077 (62)	701,949 (63)	583,194 (64)	284,095 (63)	943,418 (62)
12–17.9	299,678 (25)	393,999 (26)	270,251 (24)	214,445 (24)	107,651 (24)	408,290 (27)
Race/ethnicity						
Non-Hispanic White	320,597 (27)	443,321 (30)	235,758 (21)	144,537 (16)	132,283 (30)	471,262 (31)
Non-Hispanic Black	271,445 (23)	346,647 (23)	270,867 (24)	251,327 (28)	82,826 (18)	353,347 (23)
Hispanic	324,832 (27)	387,372 (26)	335,637 (30)	290,985 (32)	104,660 (23)	389,987 (26)
Other race/ethnicity	275,341 (23)	310,903 (21)	268,914 (24)	225,029 (25)	134,024 (30)	313,537 (21)
Type of insurance						
Private insurance	320,822 (27)	412,142 (28)	290,961 (26)	208,488 (23)	153,887 (34)	426,603 (28)
Public insurance	774,603 (65)	943,263 (63)	731,287 (66)	625,296 (69)	269,650 (59)	965,988 (63)
No insurance	82,499 (7)	102,423 (7)	79,501 (7)	67,378 (7)	24,304 (5)	104,503 (7)
Other ^b	14,009 (1)	30,056 (2)	9,273 (1)	10,503 (1)	5,951 (1)	30,676 (2)
Missing insurance information	282 (0.02)	359 (0.02)	154 (0.01)	213 (0.02)	1 (0)	363 (0.02)

Each column represents a definition of a pediatric ED and the demographic of the visits that would have been reported as presenting to a “pediatric ED” in a research study using that definition. AHA, American Hospital Association; CHA, Children’s Hospital Association; CHAMPUS, Civilian Health and Medical Program of the Uniformed Services; CHAMPVA, Civilian Health and Medical Program of the Department of Veterans Affairs; NEDI, National Emergency Department Inventory–USA; SEDD/SID, State Emergency Department Databases and State Inpatient Databases.

^aWe were unable to calculate demographics for the following definitions: SEDD/SID $\geq 70\%$ visits of patients <18 years of age and NEDI $\geq 70\%$ visits defined as pediatric because of the limitations of the data merge based on AHA identifiers.

^bOther includes pediatric ED visits with no charge or used other type of insurance (Worker’s Compensation, CHAMPUS, CHAMPVA, Title V, or other government programs).

it was 16%–30%. Use of the CHA membership definition resulted in the highest percentage of visits for White children being attributed to a pediatric ED and the lowest for non-Hispanic Black and Hispanic children. Similar patterns were seen for insurance where, depending on the definition used, the proportion of children with public insurance seen in pediatric EDs varied from 59% to 69% with the highest based on the NEDI pediatric area and the lowest percentages for the definitions based on CHA membership.

4 | DISCUSSION

Our study demonstrates that the number of EDs, percentage of visits attributed to a pediatric ED, and the pediatric population seen in a “pediatric” ED all varied markedly by definition used. Definitions that seemed to be capturing similar variables (eg, admission in SID and bed availability in AHA) still captured different populations of EDs and patients (see Figure 1). These data also emphasize the challenges in using AHAIDs for the linkage of data sets. Because the AHA often groups EDs by hospital network, it can make it difficult to calculate volume-based ED metrics for specific sites. Because SEDDs/SIDs are

frequently used for the evaluation of emergency services and health services research,^{9,11,15–18} understanding the limitations of those databases for identifying primary pediatric hospitals within larger health systems is critically important for researchers. In particular, understanding how the use of standardized linkage methodology can “hide” pediatric volume within medical systems is important, especially for investigators planning to examine pediatric care within general EDs or to compare pediatric care between general EDs and pediatric EDs. Our data demonstrate 13 CHA member hospitals that would not be identified as pediatric centers based on volume criteria in the linked data and 3 pediatric centers in each of the unlinked NEDI and SEDD/SID that would be masked in the linked data.

Because the demographic features of the treated patients changed based on the selected definition, even simple descriptive studies of the population treated in “pediatric” or “general” EDs have the potential to be meaningfully impacted by the choice of definition, potentially reducing our ability to identify disparities in care and outcomes. For example, a study using the CHA membership criteria would have a higher percentage of non-Hispanic White and privately insured patients included as pediatric visits to this type of pediatric ED than a study using the criteria of pediatric bed availability in AHA. These underlying differences

have the potential to bias studies of care provided to different populations in general and pediatric EDs, and careful attention to the definition chosen is critically important for researchers planning to study pediatric emergency care.

There are several important limitations to this work. Given that >90% of ED visits by children are reported to occur in a non-specialty facility (general ED),¹ the percentage of pediatric visits attributed to a pediatric ED in our data are higher than expected and may reflect the presence of more pediatric specialty care in New York State than in other locations in the United States, the expansiveness of the definitions studied, or the linkage methodology.

There is no “gold standard” for a pediatric ED to use for comparison. For the definitions examining volume of pediatric visits, the use of AHA hospital identification codes to combine SEDD/SID and NEDI data resulted in the merging of pediatric and adult facilities within the same organization, making it challenging to identify pediatric hospitals by volume criteria in the merged data set. We report data from only 1 state, although New York is a diverse state with both urban and rural regions. In addition, we were unable to capture data on physician staffing (eg, pediatric emergency medicine (PEM) fellowship training), nurse staffing, or other hospital characteristics that may contribute to the outcomes of care for children in pediatric EDs and could, conceivably, be used for yet another definition of what comprises a pediatric ED. Future work should focus on capturing pediatric-specific staffing to examine the specific contribution of PEM-trained clinicians on care and outcomes for pediatric patients, as the impact of staffing may be stronger than the other proposed definitions. In addition, additional work is needed to replicate these analyses in different states to better understand how best to identify pediatric hospitals in administrative data.

In summary, the merged SEDD-SID-NEDI database represents an example of what a linked data set might look like to examine a variety of health services research questions regarding pediatric emergency care and to examine the limitations of such linked databases for pediatric health services research. The merged data show the importance of careful attention to the definition used for a pediatric ED for the purposes of examining hospital quality and comparing quality and outcomes between pediatric and general EDs. To date, the definition of a “pediatric ED” is not standardized. The number of EDs captured, as well as the characteristics of ED patients seen, differs depending on definition used. In particular, volume-based definitions may make it challenging to identify pediatric hospitals, and an improved, preferably consensus definition of a pediatric ED is needed. Such a definition would facilitate the accurate representation of pediatric EDs in national databases and support efforts to improve the quality of emergency care provided to all children. During the interim, we encourage researchers and policy makers to be attentive to this ambiguity and how definitions may affect results.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

MSK wrote the manuscript and conceptualized and designed the study. AS and CC conceptualized and designed the study, assisted with interpretation of the results, and critically reviewed the manuscript for important intellectual content. KB oversaw data collection for NEDI, created the combined data set for use in the study, and reviewed the manuscript for important intellectual content. JG conducted the data analysis, and reviewed and revised the manuscript. EA assisted with interpretation of the results and critically reviewed the manuscript for important intellectual content. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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