

Pediatric Readiness and Facility Verification

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Study objective: We perform a needs assessment of pediatric readiness, using a novel scoring system in California emergency departments (EDs), and determine the effect of pediatric verification processes on pediatric readiness.

Methods: ED nurse managers from all 335 acute care hospital EDs in California were sent a 60-question Web-based assessment. A weighted pediatric readiness score (WPRS), using a 100-point scale, and gap analysis were calculated for each participating ED.

Results: Nurse managers from 90% (300/335) of EDs completed the Web-based assessment, including 51 pediatric verified EDs, 67 designated trauma centers, and 31 EDs assessed for pediatric capabilities. Most pediatric visits (87%) occurred in nonchildren's hospitals. The overall median WPRS was 69 (interquartile ratio [IQR] 57.7, 85.9). Pediatric verified EDs had a higher WPRS (89.6; IQR 84.1, 94.1) compared with nonverified EDs (65.5; IQR 55.5, 76.3) and EDs assessed for pediatric capabilities (70.7; IQR 57.4, 88.9). When verification status and ED volume were controlled for, trauma center designation was not predictive of an increase in the WPRS. Forty-three percent of EDs reported the presence of a quality improvement plan that included pediatric elements, and 53% reported a pediatric emergency care coordinator. When coordinator and quality improvement plan were controlled for, the presence of at least 1 pediatric emergency care coordinator was associated with a higher WPRS (85; IQR 75, 93.1) versus EDs without a coordinator (58; IQR 50.1, 66.9), and the presence of a quality improvement plan was associated with a higher WPRS (88; IQR 76.7, 95) compared with that of hospitals without a plan (62; IQR 51.2, 68.7). Of pediatric verified EDs, 92% had a quality improvement plan for pediatric emergency care and 96% had a pediatric emergency care coordinator.

Conclusion: We report on the first comprehensive statewide assessment of "pediatric readiness" in EDs according to the 2009 "Guidelines for Care of Children in the Emergency Department." The presence of a pediatric readiness verification process, pediatric emergency care coordinator, and quality improvement plan for pediatric emergency care was associated with higher levels of pediatric readiness. [Ann Emerg Med. 2015;■:1-9.]

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INTRODUCTION

Background

In 2006, the Institute of Medicine reported that although children account for approximately one quarter of all emergency department (ED) visits, clinical staff members caring for them in the ED are often not required to have ongoing specialized pediatric training, and pediatric-specific equipment, supplies, and specialty personnel are often lacking.^{1,2} Also highlighted in the report were a lack of regionalized systems or coordination of care for children. Yet regardless of a hospital's characteristics, critically ill children are often brought to EDs because of geographic proximity. Thus, all EDs should have at least the minimum resources and staffing available to stabilize critically ill or injured children.

Since its inception in 1984, the Federal EMS for Children Program has partnered with federal and medical professional organizations on initiatives to promote the needs of children within the broader emergency care system. The EMS for Children State Partnership Program facilitates the integration of pediatric-specific needs into the overarching state emergency care systems through assessment of 10 core performance measures.³ Two of the measures encourage states to develop a system to recognize EDs that are able to stabilize and manage pediatric medical and traumatic emergencies.

Importance

To date, 14 states have established regional or statewide pediatric categorization systems for emergency medical care.⁴ Within these systems some states (eg, Tennessee) have developed regionalized networks of pediatric emergency care.⁵ California offers state guidelines, Emergency Departments

Editor's Capsule Summary*What is already known on this topic*

Although children account for approximately one quarter of all emergency department (ED) visits, facilities vary in their ability to manage children with medical and traumatic emergencies.

What question this study addressed

With a newly developed pediatric readiness score, how prepared is each California ED to care for critically ill or injured children?

What this study adds to our knowledge

In this survey completed by 90% of the 335 EDs in California, most children were treated in general EDs. Voluntary participation in a pediatric verification program was associated with a higher pediatric readiness score.

How this is relevant to clinical practice

A higher score on this survey found considerable variation, which appeared to be enhanced by verification programs.

Approved for Pediatrics, that have been adopted by 6 emergency medical services (EMS) agencies. California hospitals can seek Emergency Department Approved for Pediatrics status by undergoing voluntary annual on-site assessments and verification by their local EMS agencies. Los Angeles County has one of the oldest Emergency Department Approved for Pediatrics verification programs, since 1985, with 60% participation among local EDs. Emergency Department Approved for Pediatrics requirements are based on state guidelines that mirror national guidelines for pediatric readiness.^{6,7} These requirements include the presence of pediatric equipment, ongoing pediatric education for staff, pediatric policies, and the identification of a pediatric medical director and a pediatric liaison nurse, either of whom may not necessarily serve in a full-time capacity in this role but who is responsible for pediatric-specific quality improvement efforts. Critically ill or injured pediatric 911 patients are preferentially transported to the nearest local Emergency Department Approved for Pediatrics in those regions where the verification process is used.

In 2001, the American Academy of Pediatrics collaborated with the American College of Emergency Physicians to develop "Care of Children in the Emergency Department: Guidelines for Preparedness," which define standards for pediatric readiness in EDs.^{8,9} An ED that maintains a baseline

level of pediatric resources as per the national guidelines is considered pediatric ready. Unfortunately, several studies have shown that our nation's EDs remain out of compliance with these guidelines.¹⁰⁻¹² Specific gaps identified included 50% of hospitals without a pediatric intensive care unit lack written transfer agreements with higher level facilities,¹³ and less than 20% of hospitals have coordinators for pediatric emergency care.¹⁴

In 2009, the American Academy of Pediatrics and American College of Emergency Physicians partnered with the Emergency Nurses Association to revise "Guidelines for the Care of Children in the Emergency Department." The 2009 version provided additional recommendations on pediatric patient safety, family-centered care, and disaster preparedness.^{15,16} The term "pediatric readiness," previously described by Gausche-Hill et al,¹⁷ refers to the full set of elements outlined in the 2009 joint policy statement.

Goals of This Investigation

The goal of this study was to use a novel scoring system to perform a needs assessment of pediatric readiness in California EDs and determine the effect of pediatric verification processes on pediatric readiness.

MATERIALS AND METHODS**Study Design and Setting**

This was a cross-sectional study conducted in the first 4 months of 2012 of ED managers at acute care hospitals in California. Before launching of the assessment, implementation of an awareness campaign about the California Pediatric Readiness Project was targeted to local, regional, and national stakeholders that included California chapters of the Emergency Nurses Association and American College of Emergency Physicians, the California Hospital Association, corporate health care groups, and local EMS agencies.

Selection of Participants

A list of all hospitals in California was acquired from the State of California EMS Authority, identifying 413 total hospitals. Hospitals lacking a continuously staffed ED, specialty hospitals (ie, Shriner's hospitals and mental health facilities), Veterans Administration hospitals, and military hospitals were excluded, resulting in 335 eligible hospitals.

Prenotice and notification letters were mailed and e-mailed to ED nurse managers, with copies sent to ED medical directors and chief executive officers, informing the potential respondents of the assessment and its purpose, followed by a link to participate in the assessment. ED

nurse managers were asked to complete the assessment in conjunction with the ED medical director. Three additional e-mail reminders were sent to nonrespondents.¹⁸ Paper surveys were mailed to all nonresponding participants with the third reminder. In addition, research nurses conducted follow-up telephone calls to nonresponding hospitals. Each respondent received a 1-year individual subscription to PEMSoft, a Broselow pediatric emergency tape, a weighted pediatric readiness score (WPRS) for their ED, benchmarking (overall median and median for similar-volume hospitals), and a gap analysis to help identify areas for facility improvement.^{19,20} Participation was voluntary and the assessment was open for 4 months, beginning in January 2012. Approval for this study was obtained through the institutional review board at the Los Angeles Biomedical Research Institute at Harbor-UCLA, Torrance, CA.

Methods of Measurement

The State of California EMS for Children Technical Advisory Committee collaborated with a national working group composed of emergency physicians, pediatric emergency physicians, emergency nurses, and administrative experts in pediatric emergency medicine, with representation from the Federal EMS for Children program, the American Academy of Pediatrics, the American College of Emergency Physicians, the Emergency Nurses Association, and the American Academy of Family Physicians, to develop the assessment tool. The national working group developed a weighted survey based on the 2009 “Guidelines for Care of Children in the Emergency Department.”¹⁷ A total of 100 points was chosen as the combined value of the 7 sections: administration and coordination; physicians, nurses, and other health care providers; quality improvement; patient safety; policies, procedures, and protocols; support services; and equipment, supplies, and medications. Members of the national working group were asked to weight each of the 7 sections. A modified Delphi approach was used to obtain feedback and determine the relative value assigned to each of the sections. A mean point score, averaged from all responses, was assigned to each section. For items within a section, members of the national working group assigned a relative importance of low, medium, or high to each of the items, according to perceived clinical relevance (ie, potential for greatest effect on the care of children). Only those items with medium to high average scores were weighted and included in the assessment tool.

The Web-based assessment incorporated 6 of the 7 areas of care (administration and coordination; physicians, nurses, and other health care providers; quality improvement; patient safety; policies, procedures, and protocols; and equipment,

supplies, and medications) outlined in the 2009 “Guidelines for Care of Children in the Emergency Department.”^{15,16} The national working group agreed that the section on support services should not be included in the assessment because of perceived clinical relevance. Additional questions on hospital demographics, awareness of the guidelines, and perceived barriers for implementation of guidelines were included. The 60-item assessment was piloted in paper and Web versions among 10 hospitals to ensure clarity, accuracy, and ease of completion (Appendix E1, available online at <http://www.annemergmed.com>).

A pediatric readiness assessment Web site was used to facilitate data entry and to reduce duplicate records (<http://www.pedsready.org>). Assessment responses were collected in the Checkbox survey software (version 5.5.2; Watertown, MA) and imported into SAS (version 9.3; SAS Institute, Inc., Cary, NC) for analysis. Assessments completed on paper were entered into the database by study investigators. All data were analyzed with SAS.

Outcome Measures

Our primary outcome measure was the WPRS (Table E1, available online at <http://www.annemergmed.com>). All participants were blinded to the WPRS and weighting methodology before completing the assessment.

Primary Data Analysis

For the purposes of comparative analysis, EDs were classified as pediatric verified if required by local or regional EMS agencies to adhere to a formal set of guidelines for pediatric readiness through regularly scheduled on-site assessments within a 3-year period and a method to hold facilities accountable (n=51). Similar to trauma center designation, the pediatric verification process includes completion of an application before an on-site visit. The requirements for pediatric verification were similar but not identical across EMS agencies and included various components as outlined in state or national guidelines.²¹ Examples of accountability included loss of pediatric 911 traffic or revocation of pediatric-receiving facility status, with development of a remediation plan until compliance was achieved (Appendixes E2 and E3, available online at <http://www.annemergmed.com>). Local or regional EMS agencies that encouraged pediatric readiness through guidelines awareness and on-site assessments but lacked a means to hold facilities accountable were considered to be “assessed” EDs (n=31). All other EDs were “nonassessed” (n=218). Separate from pediatric verification processes, EDs designated by the state as Level I and II, Level III and IV, or nontrauma centers were classified accordingly. To

evaluate the effect of annual pediatric volume on the WPRS, EDs were stratified into quartiles: low volume (fewer than 1,800 pediatric patients per year) 23% (n=70), medium volume (1,800 to 4,999 patients per year) 26% (n=78), medium-high volume (5,000 to 9,999 patients per year) 26% (n=77), and high volume (more than 10,000 patients per year) 25% (n=75).²⁰

Differences were reported with confidence intervals (CIs) to make statistical comparisons. Additionally, stratified analyses were performed to evaluate differences according to annual pediatric volume, pediatric verification status, and trauma center designation. For categorical variables, the χ^2 test was used, and for continuous variables, we used the Kruskal-Wallis test to delineate differences in median values. Finally, although our primary aim was to perform a descriptive study, to better understand the relationship between volume, verification, and trauma center designation, an exploratory multivariable linear regression analysis was performed that included the 3 aforementioned variables, with the outcome being the WPRS score.

RESULTS

Ninety percent (300/335) of ED leaders from acute care hospitals in California participated in the assessment. ED nurse leaders, holding a variety of clinical titles, completed 93% (280) of the assessments. Hospital administrators (11), ED medical directors (8), and technicians (1) completed the remaining assessments. Ninety-two percent of EDs were self-described as general EDs, 3% as pediatric EDs, and 2% within a children's hospital. Eleven EDs were directly linked to a children's hospital whether freestanding or part of a larger medical center. Of these, 3 were pediatric verified, 2 were assessed, and 6 were nonassessed.

Sixty-eight percent of EDs reported that they admit pediatric patients, with 30% of those lacking a pediatric-specific inpatient unit (Table 1).

The median annual patient volume (adult and children) in the ED was 34,000 visits (IQR 18,660, 50,599), and the median annual pediatric volume was 5,000 visits (IQR 1,900, 9,726). According to the annual volumes reported, 80% of pediatric ED visits occurred in general EDs, 19% in pediatric EDs, and 1% in standby EDs.

The median WPRS was 69 (IQR 57.7, 85.9). In general, low and medium pediatric volume EDs had lower WPRS compared to medium-high or high pediatric volume EDs (Table 2). When pediatric verification status and trauma center designation were controlled for, a higher annual pediatric volume class was associated with higher WPRS (mean difference 4 points [95% CI 2.8 to 6.0 points]). Pediatric verified EDs had higher WPRS than

Table 1. Hospital demographics and characteristics.

Hospital/ED Characteristic	No. (%)
ED Configuration (n=300)	
General	277 (92.3)
Standby	10 (3.3)
Pediatric	8 (2.7)
Children's hospital	5 (1.7)
Pediatric inpatient services (n=203)	
Nursery	175 (86.2)
NICU	133 (65.5)
Pediatric ward	110 (54.2)
Adult ward*	61 (30.0)
PICU	37 (18.2)
PECC (n=300)	
Nurse	130 (43.3)
Physician	128 (42.7)
Physician and nurse	100 (33.3)
Designated trauma centers (n=67)[†]	
Level I	14 (20.9)
Level II	34 (50.7)
Level III	11 (16.4)
Level IV	8 (11.9)
Pediatric Level I and II	14 (20.9)

NICU, Neonatal intensive care unit; PICU, pediatrics intensive care unit; PECC, pediatric emergency care coordinator.

*Of the 300 ED managers responding, 203 replied that they admit pediatric patients; 61 responded that they have no pediatric ward and admit children to an adult ward.

[†]Verified by the American College of Surgeons and recognized by the State of California EMS Authority as a trauma center.

assessed and nonassessed EDs (89.6 [IQR 84.1, 94.1] versus 70.7 [IQR 57.4, 88.9] versus 65.6 [IQR 55.5, 76.3], respectively) (Table 3). EDs directly linked to a children's hospital had a median WPRS of 95.1 (IQR 92.7, 98.9).

Level I and II trauma centers (n=48) demonstrated higher WPRS, 87 (IQR 69.4, 93.8), than Level III and IV trauma centers (n=19), 65 (IQR 53.1, 82.9), and nontrauma centers (n=233), 68 (IQR 56.7, 82.0).

Table 2. WPRS by annual pediatric volume and verification status.

Annual Pediatric Volume (n=300)	Median WPRS (IQR)
<1,800 (n=70)*	61.5 (52.1, 70.0)
Verified (n=3)	85.8 (69.3, 91.6)
Assessed (n=4)	67.1 (61.9, 69.6)
Nonassessed (n=63)	60.0 (51.6, 69.2)
1,800-4,999 (n=78)*	67.0 (54.6, 80.3)
Verified (n=12)	85.8 (77.7, 91.1)
Assessed (n=10)	67.0 (59.1, 78.3)
Nonassessed (n=56)	65.4 (51.1, 73.0)
5,000-9,999 (n=77)*	76.0 (63.1, 89.3)
Verified (n=17)	91.8 (88.1, 95.0)
Assessed (n=13)	79.5 (59.6, 89.3)
Nonassessed (n=47)	69.6 (58.5, 77.0)
>10,000 (n=75)*	81.3 (65.5, 95.0)
Verified (n=19)	92.8 (89.1, 95.7)
Assessed (n=4)	95.0 (80.7, 100)
Nonassessed (n=52)	74.5 (63.6, 89.7)

*Kruskal-Wallis test demonstrated statistically significant differences among the 4 volumes ($P<.001$).

Table 3. Median WPRS and subsection scores by verification status.

All Hospitals (No. of Points)	Verified (n=51), Median (IQR)	Assessed (n=31), Median (IQR)	Nonassessed (n=218), Median (IQR)
Overall median WPRS (100)*	89.6 (84.1, 94.1)	70.7 (57.4, 88.9)	65.5 (55.5, 76.3)
Administration (19)	19.0 (19.0, 19.0)	0 (0, 19.0)	0 (0, 9.5)
Staffing (10)	5.0 (5.0, 10.0)	10.0 (5.0, 10.0)	5.0 (5.0, 10.0)
Quality improvement (7)	7.0 (7.0, 7.0)	0 (0, 7.0)	0 (0, 5.5)
Safety (14)	14.0 (12.6, 14.0)	14.0 (12.6, 14.0)	14.0 (12.6, 14.0)
Policies and procedures (17)	14.8 (10.6, 17.0)	10.6 (8.5, 14.8)	10.6 (6.4, 12.7)
Equipment and supplies (33)	30.9 (28.8, 31.9)	31.4 (29.2, 31.9)	30.1 (27.6, 31.9)
General (3)	3.0 (3.0, 3.0)	3.0 (3.0, 3.0)	3.0 (3.0, 3.0)
Monitoring equipment (3.3)	3.3 (2.8, 3.3)	3.3 (2.8, 3.3)	3.3 (2.8, 3.3)
Fluid equipment (3.3)	3.3 (3.3, 3.3)	3.3 (3.3, 3.3)	3.3 (2.8, 3.3)
Respiratory equipment (23.4)	21.8 (19.6, 22.3)	22.3 (19.6, 22.3)	21.3 (19.1, 22.3)

*Kruskal-Wallis test demonstrated significant differences in median scores when comparing verified, assessed, and nonassessed hospitals ($P<.001$).

However, 15 (31.2%) of the 48 Level I and II trauma centers and 2 (10.5%) of the Level III and IV trauma centers were pediatric verified. An additional 6 of the Level I and II trauma centers were directly linked to a children's hospital but did not participate in a pediatric verification process. There were 14 designated pediatric trauma centers (median WPRS 95.4). Of these, 12 were either pediatric verified or directly linked to a children's hospital (median WPRS 96.0 [IQR 93.6, 99.1]). The remaining 2 nonverified, nonchildren's hospitals had a mean WPRS of 71.0. After adjusting for pediatric verification status and annual pediatric volume, trauma center designation, as well as Level I and II versus III and IV versus nontrauma center, did not affect the WPRS (mean difference 2.2 points; 95% CI 0 to 4.4 points).

Fifty percent (150/300) of EDs require pediatric competency evaluations for physicians compared with 80% (241/300) for nurses. Forty-three percent of EDs reported a physician or nurse pediatric emergency care coordinator and 33% reported having both (Table 1). Physicians and nurses designated as pediatric emergency care coordinators have a wide range of reported responsibilities (Table E2, available online at <http://www.annemergmed.com>). Pediatric verified EDs were more likely than assessed or nonassessed EDs to have a pediatric emergency care coordinator (Table 4). After adjusting of the WPRS point values for a pediatric emergency care coordinator, presence of at least 1 pediatric emergency care coordinator was associated with a higher adjusted WPRS, 85 (IQR 75, 93.1), than that of EDs without one, 58 (IQR 50.1, 66.9; median difference 27 points; 95% CI 26 to 28 points).

Forty-three percent of respondents reported the presence of a quality improvement process that included pediatric emergency care, with 87% of those having 1 or more pediatric-specific quality indicators. Pediatric verified EDs were more likely than assessed or nonassessed EDs to have a quality improvement process for pediatric emergency care

(Table 4). The presence of a quality improvement process was associated with a higher adjusted WPRS, 88 (IQR 76.7, 95), compared with that of hospitals without one, 62 (IQR 51.2, 68.7; median difference 26 points; 95% CI 25 to 27 points).

Vital sign measurements including blood pressure capabilities were universally available. However, 88% of verified EDs and 74% of nonverified EDs had a process in place to notify physicians of abnormal vital signs. Other safety measures included weighing children only in kilograms (94% of verified EDs versus 88% of nonverified EDs), and the ability to rapidly determine correct drug dosing without calculation (eg, length-based tape) (92% versus 88%) was also assessed.

The presence of policies and procedures specific to children varied. Verified EDs were more likely than nonverified EDs to have a disaster plan that included pediatric-specific elements such as equipment or medications, surge capacity, evacuation plan, and reunification with family; a family-centered care policy; a policy for death of a child in the ED; and a policy for pediatric assessment and reassessment (Table 5).

Sixty-nine percent of respondents reported having more than 90% of the recommended equipment and supplies. Although pediatric-sized equipment was generally available, the items most commonly missing included end-tidal

Table 4. Presence of pediatric emergency care coordinators and quality improvement process based on pediatric verification status.

No. (%)	Verified (n=51) (%)	Nonverified (n=249) (%)	
		Assessed (n=31)	Nonassessed (n=218)
No PECC	2 (3.9)	17 (54.8)	122 (56.0)
One PECC	49 (96.1)	14 (45.2)	96 (44.0)
Both PECCs	46 (90.2)	10 (32.3)	44 (20.2)
QI process	47 (92.2)	14 (45.2)	68 (31.2)

QI, Quality improvement.

carbon dioxide monitoring, as follows (missing in verified versus nonverified EDs): (24% versus 21%), umbilical venous catheters (8% versus 31%), central venous catheters size 4 to 7 French (10% versus 25%), tracheostomy tubes size 2.5 to 4 (0% to 22% versus 16% to 30%, respectively), laryngeal mask airways sizes 1 to 3 (22% to 27% versus 26% to 33%, respectively), and a pediatric difficult airway kit (2% versus 17%). Ninety-four percent of verified EDs and 89% of nonverified EDs reported a daily method in place to verify the location of pediatric equipment and supplies.

Of participating EDs, 87% of assessed, 64% of nonassessed, and 73% of verified EDs were aware of the 2009 “Guidelines for Care of Children in the Emergency Department.” Among nonverified EDs, the most commonly cited barriers to guidelines implementation were lack of a disaster plan (48% assessed, 57% nonassessed), cost of training personnel (42% assessed, 55% nonassessed), lack of a quality improvement plan that includes pediatric-specific elements (45% assessed, 53% nonassessed), and lack of educational resources (45% assessed, 47% nonassessed). Among verified EDs, the barriers most often reported were cost of training personnel (51%), lack of educational resources (43%), and lack of a disaster plan (41%).

LIMITATIONS

Although our study benefited from a high response rate, there are several limitations that need to be considered in interpreting the results. First, specific characteristics of the nonresponding EDs (ie, geographic setting and annual pediatric volume) are not available. Second, participant self-report was used to generate the WPRS without an on-site or independent verification, and our results are thereby subject to self-reporting bias. Third, the WPRS does not

capture all aspects of pediatric emergency care and should be considered a minimum state of readiness. There are other factors that may contribute to readiness that were not assessed. Fourth, this study was conducted in a single state that may limit universal application of results. However, California houses more than 6% of the nation’s EDs and offers a diverse population, geographic variation, and a broad range of facilities.¹⁷ In addition, California is notable for its diversity of pediatric emergency care, including corporate hospital systems and longstanding pediatric facility recognition programs that have been modeled in other states.²² Methodologically, we did not correct for multiple comparisons or multiple testing. Finally, with cross-sectional design, no causality can be attributed and only association can be inferred. Thus, our results should be regarded as hypothesis-generating rather than conclusive.

DISCUSSION

Although to our knowledge our study is the first to demonstrate an association between pediatric verification programs and improved day-to-day readiness of EDs, we also found that substantial opportunities exist for improving pediatric readiness across the full range of hospital settings. Currently, 14 states or regions have implemented pediatric verification programs. Mandatory verification programs in Tennessee and Oklahoma support a regionalized approach to pediatric emergency care by identifying the distribution of resources and gaps in pediatric emergency care and encouraging interfacility communications, transfers, and quality improvement efforts. However, as seen in California, Illinois, and Delaware, voluntary programs also promote a baseline level of pediatric readiness.²³ In Los Angeles County alone, more than 93% of all pediatric 911 transports are to Emergency Department Approved for Pediatrics verified

Table 5. Availability of pediatric policies and procedures by verification status.*

No. (%)	Verified (n = 51) (%)	Assessed (n = 31) (%)	Nonassessed (n = 218) (%)
Pediatric assessment and reassessment [†]	47 (92.2)	23 (74.2)	163 (74.8)
Interfacility transfer guidelines	47 (92.2)	30 (96.8)	186 (85.3)
Death of a child in the ED [†]	42 (82.4)	13 (41.9)	82 (37.6)
Interfacility transfer agreements [‡]	42 (82.4)	26 (83.9)	152 (69.7)
Family-centered care [†]	40 (78.4)	20 (64.5)	121 (55.5)
Age- or weight-based dosing in medical imaging	38 (74.5)	21 (67.7)	131 (60.1)
Childhood immunizations	34 (66.7)	19 (61.3)	113 (51.8)
Disaster plan with pediatric-specific elements [†]	31 (60.8)	13 (41.9)	78 (35.8)
Triage of pediatric patients	24 (47.1)	13 (41.9)	85 (39.0)
Validated pediatric triage tool	18 (35.3)	11 (35.5)	63 (28.9)

* χ^2 Test used when comparing the proportions in verified vs assessed vs nonassessed (all comparisons $P < .001$).

[†]More often present in verified EDs.

[‡]More often present in verified or assessed EDs.

facilities.²⁴ In Illinois, nearly 80% of pediatric visits to EDs and more than 90% of inpatient pediatric admissions are to pediatric verified facilities.²⁵ Depending on the institution, as well as whether there is voluntary or mandatory participation and tiers of pediatric facility recognition, each program helps identify facilities that are ready and able to stabilize or manage critically ill or injured pediatric patients.

Although the national guidelines outline the essential pediatric components, in the absence of regulations, pediatric readiness may be driven by quality improvement efforts and, when identified, pediatric emergency care coordinators. Cost of training personnel, lack of educational resources, and lack of a quality improvement plan that addresses the needs of children were among the most commonly cited barriers reported by nonverified EDs. Leaders at regional, state, and national levels should ensure that efforts to improve pediatric readiness address these areas.²⁶ Quality improvement indicators for pediatric emergency care have been suggested and may facilitate implementation of such plans at the local level.^{27,28} Higher-volume facilities may have more frequent encounters with critically ill or injured pediatric patients that help drive quality improvement efforts for pediatric emergency care and often have assigned the role of pediatric emergency care coordinator to physician and nursing staff. Both the presence of quality improvement plans and a pediatric emergency care coordinator were associated with a greater WPRS (Table 6). Although a variety of educational backgrounds and responsibilities were highlighted for coordinators (Table E2, available online at <http://www.annemergmed.com>), the identification of a pediatric emergency care coordinator who is qualified to educate and influence quality improvement efforts may lead to greater day-to-day pediatric readiness of EDs.

Although trauma center and neonatal ICU designation has been linked to improved patient outcomes,²⁹⁻³² to date, few studies highlight the association between day-to-day pediatric readiness and emergency care outcomes.^{22,25} We found that Level I and II trauma centers had higher pediatric readiness scores but that these results were not independent of pediatric verification status. Overall, local and regional assessments for pediatric readiness

Table 6. Presence of pediatric emergency care coordinator or quality improvement plan and median WPRS.

PECC	QI Plan	Median WPRS (IQR)	No. (%)
No	No	56.3 (49.0, 63.3)	116 (38.7)
No	Yes	68.7 (63.1, 73.1)	26 (8.7)
Yes	No	72.5 (64.7, 79.6)	55 (18.3)
Yes	Yes	90.8 (84.9, 95.3)	103 (34.3)

without accountability for compliance did not affect pediatric readiness to the same degree as those with a verification process. Ultimately, disaster preparedness for children necessarily depends on day-to-day readiness because critically ill and injured children will present to EDs at any time on the basis of geographic proximity. Therefore, all hospitals should maintain a baseline level of pediatric readiness in accordance with the national guidelines.

In summary, greater pediatric readiness in the ED was associated with pediatric verification programs, identified pediatric emergency care coordinators, and pediatric-specific quality improvement initiatives. In the absence of pediatric verification processes, local pediatric assessments or awareness campaigns do not appear to ensure ongoing day-to-day readiness for pediatric patients presenting to the ED.

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Table E1. Weighting scheme.

Guidelines Sections	Subsection Points	Total Points per Section
Administration and coordination		19.0
Physician PECC	9.5	
Nurse PECC	9.5	
Physicians and other practitioners staffing the ED		10.0
Physician pediatric competency evaluations	5.0	
Nurse pediatric competency evaluations	5.0	
Quality improvement		7.0
Pediatric patient care review process	5.0	
Identification of quality indicators for children	0.5	
Collection and analysis of pediatric emergency care data	0.5	
Development of an improvement plan	0.5	
Reevaluation of performance using outcomes-based measures	0.5	
Patient safety		14.0
Weighing children solely in kilograms	3.5	
Process for rapid determination of correct drug dosing	3.5	
Recording of temperature, pulse, and respiratory rate	1.4	
Blood pressure monitoring available	1.4	
Pulse oximetry monitoring available	1.4	
Procedure to notify physicians of abnormal vital signs	1.4	
Continuous access to interpreter services	1.4	
Policies, procedures, and protocols		17.0
Triage policy for children	2.125	
Pediatric patient assessment and reassessment	2.125	
Immunization assessment and management	2.125	
Death of a child in the ED	2.125	
Age- or weight-based dosing in medical imaging	2.125	
Family-centered care	2.125	
Interfacility transfer guideline	2.125	
Disaster plan with pediatric-specific elements	2.125	
Equipment, supplies, and medications specifically for children		33.0
General	3.0	
Monitoring	3.3	
Fluid resuscitation	3.3	
Respiratory and airway management	23.4	
Total		100.0

Table E2. Pediatric emergency care coordinator roles and responsibilities.

Nurse Coordinator Responsibilities (n = 130)	No. (%)
Facilitates continuing education	119 (91.5)
Assists with development and review of pediatric policies and procedures	117 (90.0)
Facilitates QI activities	114 (87.7)
Ensures pediatric-specific elements in orientation of new staff	114 (87.7)
Collaborates with physician coordinator for pediatric emergency care	106 (81.5)
Liaison to hospital committees	100 (76.9)
Promotes illness and injury prevention	100 (76.9)
Promotes pediatric disaster preparedness	85 (65.4)
Liaison to regional facilities and organizations to promote continuum of care	83 (63.8)
Ensures pediatric competency evaluations	72 (55.4)
Assists with pediatric education of out-of-hospital providers	63 (48.5)
Physician coordinator responsibilities (n = 128)	
Collaborates with nurse coordinator for pediatric emergency care	118 (92.2)
Assists with development and review of pediatric policies and procedures, equipment, and supplies	113 (88.3)
Ensures pediatric skills and knowledge of staff	105 (82.0)
Oversees QI, patient safety, and injury prevention efforts	105 (82.0)
Liaison to hospital committees	94 (73.4)
Ensures pediatric competency evaluations for staff	94 (73.4)
Facilitates pediatric education of hospital and out-of-hospital providers	87 (68.0)
Liaison to regional facilities and organizations to promote continuum of care	77 (60.2)
Ensures pediatric needs addressed in disaster plan	73 (57.0)