



Statewide Pediatric Facility Recognition Programs and Their Association with Pediatric Readiness in Emergency Departments in the United States

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Objective To describe the relationship between statewide pediatric facility recognition (PFR) programs and pediatric readiness in emergency departments (EDs) in the US.

Study design Data were extracted from the 2013 National Pediatric Readiness Project assessment (4083 EDs). Pediatric readiness was assessed using the weighted pediatric readiness score (WPRS) based on a 100-point scale. Descriptive statistics were used to compare WPRS between recognized and nonrecognized EDs and between states with or without a PFR program. A linear mixed model with WPRS was used to evaluate state PFR programs on pediatric readiness.

Results Eight states were identified with a PFR program. EDs in states with a PFR program had a higher WPRS compared with states without a PFR program (overall a 9.1-point higher median WPRS; $P < .001$); EDs recognized in a PFR program had a 21.7-point higher median WPRS compared with nonrecognized EDs ($P < .001$); and between states with a statewide PFR program, there was high variability of participation within the states. We found state-level PFR programs predicted a higher WPRS compared with states without a PFR program ($\beta = 5.49$; 95% CI 2.76-8.23).

Conclusions Statewide PFR programs are based on national guidelines and identify those EDs that adhere to a standard level of readiness for children. These statewide PFR initiatives are associated with higher pediatric readiness. As scalable strategies are needed to improve emergency care for children, our study suggests that statewide PFR programs may be one way to improve pediatric readiness and underscores the need for further implementation and evaluation. (*J Pediatr* 2020;218:210-6).

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High-quality emergency care for sick or injured children is expected regardless of where in the US emergency care is delivered. However, a 2006 Institute of Medicine report characterized the state of pediatric emergency care as “uneven.”¹ Over the past 2 decades, efforts have been implemented to improve pediatric emergency care. In 2001, the American Academy of Pediatrics, and the American College of Emergency Physicians have developed the first national joint policy statement that served as a guideline for the care of children in the emergency department (ED). This policy statement was updated in 2009² with additional sponsorship from the Emergency Nurses Association, and most recently revised in 2018.³ Adherence to these guidelines forms the basis for the term “pediatric readiness.”³ In 2013, a multiphase national quality improvement effort, the National Pediatric Readiness Project (NPRP), was launched by the co-authoring groups and the Health Resources Services Administration Emergency Medical Services for Children (HRSA EMSC) program to assess gaps in pediatric readiness based on the consensus guidelines and identify resources for improvement.^{2,4,5}

In 2013, all EDs in the US were self-assessed for pediatric readiness. Results from the 2013 NPRP assessment demonstrated modest improvements in pediatric readiness in EDs from previous published assessments. The median weighted pediatric readiness score (WPRS) increased from 55.0 to 68.9 on a 100-point

ED	Emergency department
EMSC	Emergency medical services for children
FRP	Facility recognition program
HRSA	Health Resources Services Administration
NPRP	National Pediatric Readiness Project
PFR	Pediatric facility recognition
WPRS	Weighted pediatric readiness score

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scale between 2003 and 2013,^{3,6} but there remain significant gaps and disparities in pediatric readiness across the spectrum of EDs in the US.⁶⁻⁸

After the NPRP assessment, numerous tools and resources were created to facilitate and test improvements in pediatric readiness.² One tool is the Facility Categorization Toolbox designed to equip hospitals and EDs with resources to prepare for pediatric emergencies.⁹ In other disciplines, programs that have defined standards for care via a designation process have improved processes of care and led to associated improvements in outcomes including pediatric surgery,¹⁰ neonatal care,¹¹ trauma,¹²⁻¹⁶ and others.^{17,18} In addition, the presence of resources that specifically target the pediatric population have been associated with improved health outcomes.¹⁹⁻²² To address gaps in readiness of EDs to care for children, some states, through their EMSC state partnership program, have developed voluntary pediatric facility recognition (PFR) programs to recognize and encourage EDs that prioritize pediatric readiness. In 2013, 8 states had developed voluntary PFR programs. Each of the PFR programs are based on the joint policy statement on pediatric readiness²; however, PFR programs in each of these states vary relative to specific criteria for recognition and the degree of participation in the state. Common features of all PFR programs include (1) an application process and incentives for meeting established standards, (2) a lead state-level agency to implement a process to verify pediatric capabilities of facilities, (3) a verification process to assure compliance with standards, and (4) well-defined standards for pediatric-specific resources.

This study aimed to evaluate the relationship between PFR programs and pediatric readiness in EDs across the US.

Methods

The primary data source for this study was the 2013 NPRP assessment. The detailed implementation methods for the assessment have been previously described.⁴ Briefly, the assessment is a 55-question web-based questionnaire based on the 2009 Guidelines for the Care of Children in the Emergency Department (Joint Policy Statement).^{3,5} The assessment was voluntarily completed via a Web page link that was sent to the ED nurse manager at 5017 US facilities where an ED was defined as providing emergency care 24 hours a day, 7 days a week. More than 4100 managers responded, resulting in an 83% response rate. Because we were studying statewide initiatives, which may not be available or appropriate for a territory, we excluded the 8 US territories from this analysis.

The assessment addressed 6 domains recommended in the Joint Policy Statement: coordination of care, physician/nurse competencies, quality improvement, patient safety, policies/procedures, and equipment/supplies.^{2,4} Overall readiness was assessed by the WPRS, which has been described previously.^{3,4,23} The WPRS is a summary score that weights 24 of the 55 questions to generate a score normalized to a

100-point scale. A WPRS of 100 indicates that the ED meets all of the critical elements from the guidelines for pediatric readiness. Coordination of care was measured by the presence of a pediatric emergency care coordinator, who is a nurse or physician with special interest, knowledge, and competencies in pediatric emergency care, and who has the responsibility to promote, oversee, and facilitate improvements in pediatric emergency care.³

Facility Recognition Program

All HRSA EMSC state partnership programs are required to report to the federal EMSC program on progress made toward 9 performance measures.²⁴ States with PFR programs—as part of the EMSC state partnership programs—were identified based on the self-reported responses. State PFR programs were identified by HRSA EMSC staff through document review and contact with the state partnership EMSC state managers. Staff members from the EMSC National Resource Center (Washington, DC) contacted each of the EMSC state partnership program managers who reported the presence of a PFR program to obtain details regarding the program including key program characteristics (eg, explicit verification body, detailed verification and re-verification process, onsite verification, etc). Additionally, program applications, standards, and other documents were reviewed and verified. The presence of a PFR program was measured as a binary variable (yes/no) and was reported and verified by each state for ED-level PFR programs.

This process identified 8 states in 2013 with PFR programs: Arizona, California, Delaware, Illinois, New Jersey, Tennessee, Utah, and West Virginia.

Variables in this analysis followed those described previously in the literature from the NPRP assessment.⁴ The primary outcome was the WPRS score. Demographic variables included Joint Commission Certification, Centers for Medicare and Medicaid Services certification, inpatient services offered, ED configuration (general, pediatric, freestanding, or standby), hospital type (standby, basic, general, or comprehensive), and pediatric volume category as low pediatric volume (annual pediatric volume of <1800 or ≤5 patients a day), medium (annual pediatric volume between 1800 and 4999), medium high (between 5000 and 9999), and high (≥10 000).^{5,16,23} The number of estimated pediatric visits was derived by using the reported number, or if not reported, estimating pediatric visits based on hospitals with comparable volumes. Hospital location was classified using the 2013 US Department of Agriculture's 12-part county urban influence codes classification scheme.²⁵ The 4 regions were defined using the US Census Bureau definitions.²⁶ The assessment was approved by the University of Utah Institutional Review Board.

Statistical Analyses

For categorical variables, frequencies and percentages were calculated. For continuous variables, medians and IQRs were calculated. Hospital characteristics and WPRS were compared between recognized and nonrecognized EDs (in

all states regardless of the presence of a PFR program) using a univariable multilevel model, with EDs nested in states. EDs in states that had implemented a PFR program were compared with EDs in states that had not implemented a PFR program using a Wilcoxon rank-sum test. A linear mixed model was conducted with WPRS as the outcome and The Joint Commission certification, state-level PFR programs, ED configuration, inpatient pediatric services offered, and pediatric patient volume as predictors. The predictors were chosen based on clinical and statistical significance. Variables were tested in a univariable model for statistical significance at a level of 0.1. If significant, variables were included in the final mixed model. The model accounted for ED nested in states while also adjusting for region to control for possible clustering of state PFR programs. Analyses were conducted using SAS 9.4 (SAS Institute, Cary, North Carolina).

Results

A total of 4083 EDs responded that were able to be categorized as in a state with or without a PFR program in their state and were included in the analysis. Response rates ranged from 47.1% to 100% with more than 70% of states obtaining

an 80% or higher response rate. Rates varied from 76.6% to 100% for states with a recognition program and from 47.1% to 100% for states without a program. Of these, 370 EDs (9.1%) had received PFR across the 8 states with a PFR program. Compared with non PFR EDs, PFR EDs showed higher rates of The Joint Commission accreditation (85.4% vs 66.5%; $P = .044$), higher proportion in urban settings (80.3% vs 57.7%), higher total ED patient volume (median, 35 615; IQR, 19 000-55 335 vs median, 19 191; IQR, 7200-40 000; $P = .001$), and higher pediatric patient volume (median, 5987; IQR, 2719-11 749 vs median, 2551; IQR, 700-6033; $P < .001$). The demographics of the participating EDs are presented in **Table I**.

We examined facility recognition adoption rates within the 8 states with a PFR program. At the time of the NPRP assessment, 2 of the 8 states with PFR programs had 100% of their EDs as pediatric facility recognized (New Jersey, 70/70; and Tennessee, 95/95). More details are provided in **Table II** (available at www.jpeds.com).

Association between PFR and ED-Level Readiness

EDs that were recognized in a PFR program had higher WPRS scores compared with nonrecognized EDs (median

Table I. Hospital characteristics

Characteristics	ED facility recognition		Overall (n = 4083)	P value
	No (n = 3713)	Yes (n = 370)		
Joint Commission Certification	2471 (66.5)	316 (85.4)	2787 (68.3)	.044
CMS accredited	3421 (92.1)	341 (92.2)	3762 (92.1)	.371
Hospital geographic location				<.001
Urban	2141 (57.7)	297 (80.3)	2438 (59.7)	
Suburban	352 (9.5)	29 (7.8)	381 (9.3)	
Rural	800 (21.5)	33 (8.9)	833 (20.4)	
Remote	419 (11.3)	11 (3.0)	430 (10.5)	
Not determined	1 (0.0)	0 (0.0)	1 (0.0)	
ED configuration				<.001
General	3181 (85.7)	309 (83.5)	3490 (85.5)	
Pediatric	75 (2.0)	12 (3.2)	87 (2.1)	
Separate pediatric	169 (4.6)	42 (11.4)	211 (5.2)	
Standby	164 (4.4)	1 (0.3)	165 (4.0)	
Freestanding	87 (2.3)	2 (0.5)	89 (2.2)	
Other	37 (1.0)	4 (1.1)	41 (1.0)	
Inpatient pediatric services offered	2990 (80.5)	320 (86.5)	3310 (81.1)	<.001
Pediatric emergency care coordinator				<.001
None	1400 (37.7)	31 (8.4)	1431 (35.0)	
Nurse only	686 (18.5)	40 (10.8)	726 (17.8)	
Physician only	222 (6.0)	8 (2.2)	230 (5.6)	
Both	1405 (37.8)	291 (78.6)	1696 (41.5)	
Geographic region				.780
Northeast	428 (11.5)	70 (18.9)	498 (12.2)	
Midwest	1170 (31.5)	102 (27.6)	1272 (31.2)	
South	1364 (36.7)	112 (30.3)	1476 (36.1)	
West	751 (20.2)	86 (23.2)	837 (20.5)	
Pediatric patient volume				<.001
Low (<1800 pediatric patients/year)	1565 (42.1)	55 (14.9)	1620 (39.7)	
Medium (1800-4999 patients)	1114 (30.0)	114 (30.8)	1228 (30.1)	
Medium High (5000-9999 patients)	598 (16.1)	95 (25.7)	693 (17.0)	
High (≥10 000 patients)	436 (11.7)	106 (28.6)	542 (13.3)	
Estimated pediatric patient visits	2551 [700, 6033]	5987 [2719, 11 749]	2776 [782, 6561]	<.001
Estimated total ED patient visits	19 191 [7200, 40 000]	35 615 [19 000, 55 335]	21 000 [8000, 42 000]	.001

CMS, Centers for Medicare and Medicaid Services.

Values are number (%) or median [Q1, Q3].

P values were calculated using a linear mixed model with EDs nested in states.

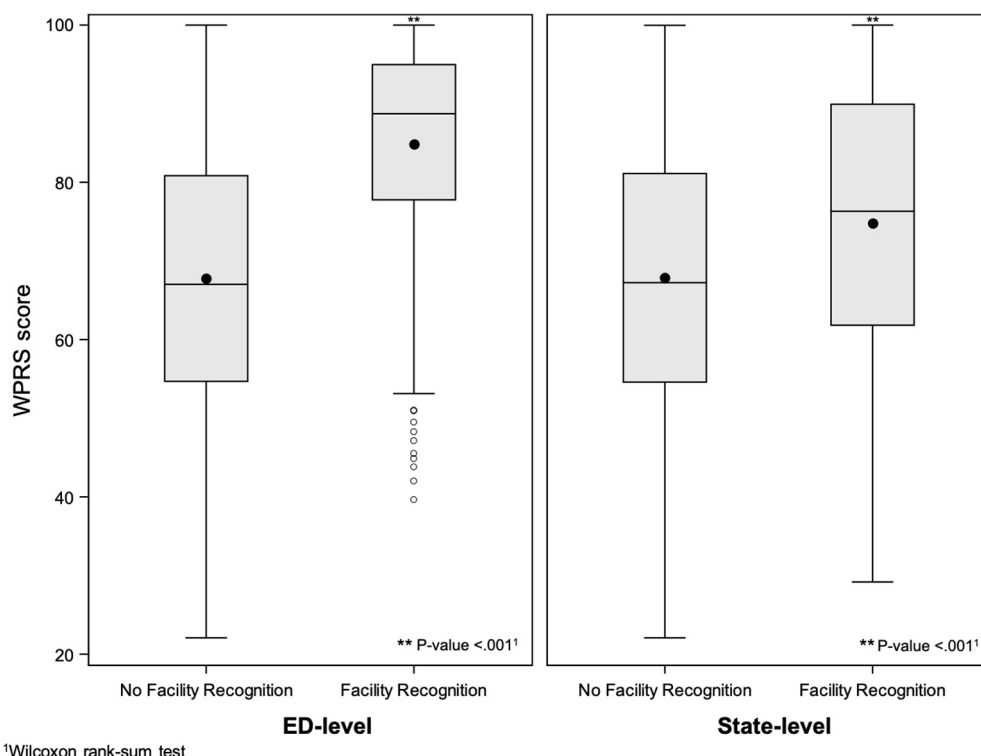


Figure. The median WPRS scores in hospital-level and statewide PFR. Boxplots are provided of the median WPRS scores at the hospital level (left) and state level (right) stratified by participation in a PFR program. The grey boxes represent IQR and the whiskers represent the 95% CI. P values were calculated using the Wilcoxon rank-sum test.

WRPS, 88.7; IQR, 77.8-94.8 vs median QRPS, 67.0; IQR, 54.7-80.9; $P < .001$) (Figure). All WPRS subcomponents (coordination of care, physician/nurse staffing, quality improvement, patient safety, policies/procedures, and equipment/supplies) were higher in recognized EDs compared with nonrecognized EDs (all $P < .001$). These data are summarized in Table III (available at www.jpeds.com).

Association between PFR and State-Level Readiness

The 8 states with a PFR program had higher WPRS scores compared with states without any PFR program (median

WRPS, 76.3; IQR, 61.8-89.9 vs median WRPS, 67.2; IQR, 54.6-81.1; $P < .001$) (Figure). Additionally, PFR states had significantly higher WPRS subcomponents compared with non-PFR states across domains with the exception of patient safety (Table IV).

Using a linear mixed model with WPRS as the primary outcome, we examined the association between state PFR programs and WPRS controlling for The Joint Commission certification, ED configuration, inpatient pediatric services, and pediatric patient volume at the individual ED level. In this model, we found state PFR program predicted a higher WPRS compared with states without a PFR program ($\beta = 5.49$; 95% CI, 2.76-8.23) (Table V).

Table IV. WPRS by state facility recognition

Variables	Overall (n = 4083)	State facility recognition program		P value*
		No (n = 3253)	Yes (n = 830)	
Score	68.9 [56.0, 83.6]	67.2 [54.6, 81.1]	76.3 [61.8, 89.9]	<.001
Administration and coordination	9.5 [0.0, 19.0]	9.5 [0.0, 19.0]	14.3 [0.0, 19.0]	<.001
Physicians, nurses, and other ED staff	5.0 [0.0, 10.0]	5.0 [0.0, 10.0]	5.0 [0.0, 10.0]	<.001
QI/PI in the ED	0.0 [0.0, 6.5]	0.0 [0.0, 6.5]	5.8 [0.0, 7.0]	<.001
Pediatric patient safety	10.5 [9.1, 14.0]	10.5 [9.1, 14.0]	10.5 [9.1, 14.0]	.345
Policies, procedures, and protocols	11.0 [7.2, 14.9]	11.0 [7.2, 14.9]	11.5 [7.6, 14.9]	<.001
Equipment, supplies, and medications	30.0 [27.4, 32.4]	29.8 [27.0, 32.4]	31.3 [28.7, 33.0]	<.001

QI/PI, Quality improvement/practice improvement.

Values are median [Q1, Q3].

*P values were calculated using a Wilcoxon rank-sum test.

Table V. Linear mixed model results predicting hospital-level WPRS

Variables	Unadjusted estimate	Estimate	95% CI
State-level facility recognition	8.31	5.49	2.76 to 8.23
Joint Commission certification	9.63	5.10	3.93 to 6.27
ED configuration			
Freestanding ED	-22.1	-13.95	-18.7 to -9.16
General ED	-27.8	-19.81	-23.4 to -16.3
Other	-26.1	-18.8	-24.5 to -13.1
Separate pediatric ED	-7.87	-6.59	-10.4 to -2.77
Standby ED	-39.2	-26.36	-30.7 to -22.0
Pediatric ED	Reference	Reference	Reference
Inpatient pediatric services offered	4.44	1.52	0.25 to 2.80
Pediatric patient volume			
High	20.61	10.77	8.84 to 12.70
Medium high	10.60	7.54	6.08 to 9.01
Medium	6.78	4.73	3.53 to 5.94
Low	Reference	Reference	Reference

Discussion

Our study examined the relationship between state PFR programs and pediatric readiness in EDs in the US. We found that among states with PFR programs, the median WPRS was higher compared with states without a PFR program (even when including EDs that were not recognized). Pediatric facility recognized EDs that were formally recognized via a state PFR program had significantly higher WPRS compared with nonrecognized EDs. Between states with a statewide PFR program, there was high variability of participation within the state. These findings show that PFR programs may improve pediatric readiness at both the state and ED levels.

Scalable strategies are needed to improve emergency care for children. Our study suggests that statewide PFR programs could improve pediatric readiness of EDs. The quality of pediatric emergency care is variable across EDs, where smaller pediatric volume EDs are less prepared for pediatric emergencies compared with larger pediatric volume EDs across a variety of metrics^{4,6,23,25} and, as such, have increased mortality rates and poorer outcomes compared with EDs with higher pediatric patient volume.^{6,27-33} Yet, collectively, the largest number of children are seen in the lowest volume EDs,⁸ many of which are rural EDs.⁴ National, statewide, and local initiatives that target lower volume EDs could serve as effective strategies for improving pediatric readiness and potentially patient outcomes. Example of these initiatives include quality improvement programs,³⁴⁻³⁶ statewide³⁷ or local³⁸ partnerships between pediatric facilities and smaller volume EDs, or coordinated systems of pediatric emergency care.³⁹ For example, the Institute of Medicine recommends a pediatric emergency care coordinator to provide oversight of emergency care services to children and integrate and promote pediatric education, policies, and procedures in pediatric emergency care.⁴⁰ It is noteworthy that all states with a PFR program require a pediatric emergency care coordinator

in the hospital recognition process. Increasing evidence suggests that these types of initiatives have improved processes of care^{4,34,41} and even patient outcomes (eg, mortality).⁴² At the state level, some states have reported on the development of a statewide PFR program—especially in Illinois, which reported in 2009 on the development of its statewide PFR program.⁴³ The Illinois PFR program, which began the first pilot phase in 1998, was created after a 1994 needs assessment and subsequent task force that was formed in 1995 in the state.⁴³ Additionally, a PFR program in California has been described.⁴⁴ Since 2013, 3 additional states have added PFR programs: Ohio, Alaska, and Montana, bringing the total number of states with PFR programs to 11. Additionally, a quality improvement collaborative was formed in 2016 composed of 14 states to develop a PFR program: Colorado, Connecticut, District of Columbia, Florida, Indiana, Kansas, Kentucky, Michigan, New Mexico, New York, Oklahoma, Pennsylvania, South Carolina, and Texas.⁴⁵

In our study of national EDs, we also found that EDs participating in a PFR program had higher pediatric readiness compared with nonrecognized EDs, which is supported by findings from previous studies. In California, for example, EDs recognized in a PFR program demonstrated higher pediatric readiness compared with non-PFR EDs in a study of 300 EDs.⁴⁴ Additionally, PFR programs have been described in critical access hospitals. In 2018, Pilkey et al reported that among 1140 critical access hospitals in the US, a PFR program was associated with significantly higher WPRS scores.⁴⁶ Similar differences were also seen in the current report of US EDs.

We also noted significant variability in participation rates of states with a statewide PFR program. Of the 8 states with a statewide PFR program, 2 states had a 100% adoption rate (New Jersey and Tennessee). Other participation rates varied widely from 15.6% to 80%. Although statewide PFR programs share key characteristics, there is no national program nor a means to standardize state programs, which may lead to significant differences between states. Cichon et al reported on some barriers to implementation of the PFR program in Illinois, including lack of personnel to perform onsite audits, lack of perceived need, and reluctance to complete the application.⁴³ Strategies such as an all-inclusive approach to reduce these and other barriers to implementation (eg, cost) should be explored to encourage more EDs to participate in a PFR program—and increased awareness of incentives that PFR programs offer. For example, PFR programs incentivize participation in a number of ways, including (1) public recognition that the facility is Pediatric Ready (eg, Emergency Department Approved for Pediatrics or a Pediatric Receiving Center), (2) pediatric patients preferentially transported by emergency medical services to recognized pediatric-ready facilities (ie, bypass facilities not participating in the program), (3) educational offerings for staff on topics related to pediatric emergency care, (4) time allocated away from clinical duties to provide support of pediatric readiness efforts, and (5) access to resources and tools developed by the state EMSC program.⁴⁷

Although we noted higher WPRS scores in hospitals and states with PFR programs in this study, the relationship between WPRS data and patient outcomes has not yet been extensively studied, although there is some early evidence of an association between PFR programs and patient outcomes. In Arizona, for instance, Rice et al reported on patient outcomes following the implementation of the Arizona Pediatric Prepared Emergency Care program, which is a 3-tiered voluntary verification system launched in 2012.⁴² The authors reported a slight reduction in overall mortality of children in the ED and a significant reduction in injury-related deaths in the precertification to postcertification phase. Additionally, a controlled pre-post study design of a PFR program implementation in Delaware from Ball et al reported some early and limited improvements in care to injured children.⁴⁸

More work is warranted to understand the differences between the statewide programs and how these programs impact patient outcomes within and across states for PFR. This is especially important in rural and low and medium pediatric volume EDs, which are the most likely to be under-resourced for pediatric emergencies.⁴⁶ PFR programs could be a one strategy to improve pediatric emergency care across EDs, especially in low-volume and rural sites. Importantly, however, as of 2013, only 9% of EDs in our study participated in a PFR program and only 8 states out of 50 US states had a statewide PFR program, which underscores a large opportunity for additional PFR-based initiatives. Resources and a facility categorization toolkit are available on the EMSC website.⁹

This study has several limitations. The data were obtained from self-reported assessments from ED nurse administrators or ED medical directors; it is possible that some sites may have over-reported or under-reported the presence of equipment and other components of pediatric readiness. Also, there is significant heterogeneity of the statewide PFR programs. For example, PFR programs may differ by offering single vs multiple tiers of recognition, requirements for on-site verification of readiness, renewal time periods, and (voluntary vs mandatory participation). These data were not captured in the PFR program data available to us and were thus not included in the analyses. Additionally, at the time of the NPRP assessment, some of the PFR programs had been active for decades and others were less than 5 years old (ie, AZ, DE), perhaps limiting the potential relationship with state-level readiness. This factor may limit the generalizability of the findings. Future studies may address these limitations and may be able to prospectively evaluate the impact of PFR programs on pediatric readiness.

Facility recognition programs both at the ED and state level are associated with higher pediatric readiness. We found that there is a significant, and large, improvement associated with PFR programs at the ED level, a smaller but significant improvement with statewide PFR programs, and high variability of PFR program adoption by EDs. Additional work is needed to understand the variability of PFR programs

and to understand strategies that result in increased adoption in statewide programs. ■

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Table II. EDs with facility recognition programs within states that have a facility recognition program

States with facility recognition program	ED has facility recognition program	
	No (n = 460)	Yes (n = 370)
Arizona	65 (84.4)	12 (15.6)
California	246 (82.0)	54 (18.0)
Delaware	2 (20.0)	8 (80.0)
Illinois	79 (43.6)	102 (56.4)
New Jersey	0 (0.0)	70 (100.0)
Tennessee	0 (0.0)	95 (100.0)
Utah	26 (56.5)	20 (43.5)
West Virginia	42 (82.4)	9 (17.6)

Values are number (%).

Table III. ED WPRS by ED facility recognition

Variables	ED facility recognition		Overall (n = 4083)	P value
	No (n = 3713)	Yes (n = 370)		
Administration and coordination	9.5 [0.0, 19.0]	19.0 [19.0, 19.0]	9.5 [0.0, 19.0]	<.0001
Physicians, nurses, and other ED staff	5.0 [0.0, 10.0]	10.0 [5.0, 10.0]	5.0 [0.0, 10.0]	<.0001
QI/PI in the ED	0.0 [0.0, 6.5]	7.0 [6.0, 7.0]	0.0 [0.0, 6.5]	<.0001
Pediatric patient safety	10.5 [9.1, 14.0]	11.6 [10.5, 14.0]	10.5 [9.1, 14.0]	<.0001
Policies, procedures, and protocols	10.6 [7.2, 13.6]	13.2 [9.8, 15.3]	11.0 [7.2, 14.9]	<.0001
Equipment, supplies, and medications	30.2 [27.0, 32.4]	31.9 [29.7, 33.0]	30.2 [27.4, 32.4]	<.0001
Score	67.0 [54.7, 80.9]	88.7 [77.8, 94.8]	68.9 [56.0, 83.6]	<.0001

QI/PI, Quality improvement/practice improvement.

P values were calculated using a linear mixed model with EDs nested in states.

Values are median [Q1, Q3].