Improving Pediatric Readiness in General Emergency Departments: A Prospective Interventional Study

Kamal Abulebda, MD[1], Travis Whitfill, MPH[2,3], Erin E. Montgomery, RN[4], Anita Thomas, MD, MPH[5], Robert A. Dudas, MD[6], James S. Leung, MD, FRCPC[7], Daniel J. Scherzer, MD[8], Michelle Aebersold, PhD, RN[9], Wendy L. Van Ittersum, MD[10], Shruti Kant, MD[11], Theresa A. Walls, MD, MPH[12], Anna K. Sessa, EMT-P[13], Stephen Janofsky, MD[14], Daniel B. Fenster, MS, MD[15], David O. Kessler, MD, MSc[15], Jenny Chatfield, MN[16], Pamela Okada, MD[17], Grace M. Arteaga, MD[18], Marc D. Berg, MD[19], Lynda J. Knight, RN[19], Ashley Keilman, MD[5], Ana Makharashvili, MD[2], Grace Good, RN[12], Ladonna Bingham, MD[6], Emily J. Mathias, MD[20], Kristine Nagy, RN[10], Melinda F. Hamilton, MD[21], Samreen Vora, MD, MHA[22], Karen Mathias, APRN, MSN[22], Marc A. Auerbach, MD, MSc[2,3], Improving Pediatric Acute Care through Simulation (ImPACTS)*

Objective To describe the impact of a national interventional collaborative on pediatric readiness within general emergency departments (EDs).

Study design A prospective, multicenter, interventional study measured pediatric readiness in general EDs before and after participation in a pediatric readiness improvement intervention. Pediatric readiness was assessed using the weighted pediatric readiness score (WPRS) on a 100-point scale. The study protocol extended over 6 months and involved 3 phases: (1) a baseline on-site assessment of pediatric readiness and simulated quality of care; (2) pediatric readiness interventions; and (3) a follow-up on-site assessment of WPRS. The intervention phase included a benchmarking performance report, resources toolkits, and ongoing interactions between general EDs and academic medical centers.

Results Thirty-six general EDs were enrolled, and 34 (94%) completed the study. Four EDs (11%) were located in Canada, and the rest were in the US. The mean improvement in WPRS was 16.3 ($P < .001$) from a baseline of 62.4 (SEM = 2.2) to 78.7 (SEM = 2.1), with significant improvement in the domains of administration/coordination of care; policies, protocol, and procedures; and quality improvement. Six EDs (17%) were fully adherent to the protocol timeline.

Conclusions Implementing a collaborative intervention model including simulation and quality improvement initiatives is associated with improvement in WPRS when disseminated to a diverse group of general EDs partnering with their regional pediatric academic medical centers. This work provides evidence that innovative collaboration facilitated by academic medical centers can serve as an effective strategy to improve pediatric readiness and processes of care. *(J Pediatr 2021;230:230-7)*.

Each year in the US, over 30 million acutely ill and injured children are evaluated in an emergency department (ED). The majority (90%) of these children receive care in general EDs that concurrently care for children and adults,[1,2] and the minority of these visits occur in pediatric EDs designed and operated primarily to care for children.[1] The gap in pediatric care between

ED	Emergency department
EMSC	Emergency Medical Services for Children
ImPACTS	Improving Pediatric Acute Care through Simulation
NPRP	National Pediatric Readiness Project
PECC	Pediatric emergency care coordinator
WPRS	Weighted pediatric readiness score

From the [1]Division of Pediatric Critical Care Medicine, Department of Pediatrics, Indiana University School of Medicine and Riley Hospital for Children at Indiana University Health, Indianapolis, IN; [2]Department of Pediatrics, Yale University School of Medicine, New Haven, CT; [3]Department of Emergency Medicine, Yale University School of Medicine, New Haven, CT; [4]LifeLine Critical Care Transport, Indiana University Health, Indianapolis, IN; [5] Department of Pediatrics, Division of Emergency Medicine, University of Washington School of Medicine, Seattle, WA; [6]Department of Pediatrics, Johns Hopkins All Children's Hospital, Saint Petersburg, FL; [7]Division of Pediatric Emergency Medicine, Department of Pediatrics, Faculty of Health Sciences, McMaster University, Hamilton, Ontario, Canada; [8]Division of Pediatric Emergency Medicine, Nationwide Children's Hospital, Ohio State University College of Medicine, Columbus, OH; [9]University of Michigan, School of Nursing, Ann Arbor, MI; [10]Division of Pediatric Hospital Medicine, Department of Pediatrics, Akron Children's Hospital, Northeast Ohio Medical University, Akron, OH; [11]Department of Emergency Medicine and Pediatrics, University of California San Francisco, San Francisco, CA; [12]Department of Pediatrics, Division of Emergency Medicine, The Children's Hospital of Philadelphia at the University of Pennsylvania Perelman School of Medicine, Philadelphia, PA; [13]Office of Emergency Medical Services, Dartmouth-Hitchcock Medical Center, Lebanon, NH; [14]Division of Pediatric Emergency Medicine, Department of Pediatrics, University of Pittsburgh School of Medicine, Children's Hospital of Pittsburgh, Pittsburgh, PA; [15]Department of Emergency Medicine, Morgan Stanley Children's Hospital of New York Presbyterian at Columbia University Medical Center, New York, NY; [16]KidSIM-ASPIRE Simulation Research Program, Alberta Children's Hospital, University of Calgary, Calgary, Alberta Canada; [17]Department of Pediatrics, University of Texas Southwestern School of Medicine, Dallas, TX; [18]Department of Pediatrics and Adolescent Medicine, Division of Pediatric Critical Care, Mayo Clinic, Rochester, MN; [19]Davison of Critical Care Medicine, Lucile Packard children's Hospital Stanford, Stanford University College of Medicine, Palo Alto, CA; [20]Department of Emergency Medicine, University of Michigan Medical School, Ann Arbor, MI; [21]Department of Critical Care Medicine and Pediatrics, Children's Hospital of Pittsburgh, University of Pittsburgh Medical Center, Pittsburgh, PA; and [22]Children's Minnesota, Minneapolis, MN

*List of additional Improving Pediatric Acute Care Through simulation (ImPACTS) investigators are available at www.jpeds.com (**Appendix 1**).

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pediatric EDs and general EDs has been associated with a disparity in health outcomes of critically ill children. Children presenting to high volume pediatric EDs have higher survival rates compared with those presenting to general EDs.[3,4]

Pediatric emergency readiness is a measure of an ED's compliance with the joint policy statement for the care of children in the ED endorsed by the American Academy of Pediatrics, the American College of Emergency Physicians, and the Emergency Nurses Association.[5] The weighted pediatric readiness score (WPRS) is a measure of adherence with these guidelines across 6 domains. A national survey of pediatric readiness in 2013 revealed a median WPRS of 68.9 on 100-point scale.[5] Notably, low-pediatric-volume EDs (of which the vast majority are general EDs) underperformed compared with high-pediatric-volume EDs with a mean WPRS score of 61 vs 90, respectively. Critically ill children presenting to EDs with the highest WPRS have a 4-fold reduction in the odds of death compared with those presenting to EDs with lower WPRS.[6] Significant associations between WPRS, mortality rate, and the length of stay in both the hospital and intensive care unit setting have also been reported.[7] Multiple studies have also noted that general EDs with lower WPRS are less likely to adhere to best practice guidelines in a simulated environment for high acuity conditions[8] including sepsis,[9] seizure,[10] cardiac arrest,[11] diabetic ketoacidosis,[12] and respiratory failure.[13]

To address this variability, several US states and national organizations have implemented programs to improve pediatric readiness including the National Pediatric Readiness Project (NPRP). The NPRP was formed by the Emergency Medical Services for Children (EMSC) and other national stakeholders as a multiphase quality improvement initiative to promote pediatric readiness and revealed the central role of a pediatric emergency care coordinator (PECC) to the readiness of any ED that care for children.[5] Parallel to the NPRP work, the Improving Pediatric Acute Care through Simulation (ImPACTS) network was formed as a national collaborative of pediatric Academic Medical Centers to improve pediatric readiness (https://www.impactscollaborative.com/sites-1). The ImPACTS network involves a hub-and-spoke model of collaboration including in situ simulation, education, and quality improvement initiatives between academic medical centers (the ImPACTS regional "hub") and local general EDs (the "spokes"). ImPACTS investigators have reported simulation-based comparisons of variations in the quality of care delivered to critically ill infants and children in general EDs vs pediatric EDs.[8-10,14] We completed an interventional collaborative project between academic medical centers and general EDs in Indiana and Connecticut and found significant improvement in pediatric readiness scores across 22 participating general EDs at 6 months compared with baseline.[15,16]

The goal of this study was to disseminate the ImPACTS model for improving pediatric readiness to a larger cohort of academic medical centers and general EDs. The primary objective of this study was to assess the effect of the ImPACTS model on WPRS across a diverse set of general EDs working with regional pediatric academic medical centers in the US and Canada. We hypothesized that a multifaceted collaborative improvement program between pediatric academic medical centers and general EDs would result in significant improvement in pediatric readiness.

Methods

This study was a prospective, multicenter, interventional study to measure WPRS of general EDs before and after participation in a collaborative pediatric readiness improvement intervention. This study was conducted between January 2018 and January 2020. Institutional Review Board approval was obtained from each collaborating academic medical center based on each participating hospital's requirements with the majority of reviews deemed exempt.

Study Setting and Population

Investigators from 19 pediatric academic medical centers recruited general EDs in their respective geographic regions to participate. Two academic medical centers (located in Indiana and Connecticut) participated in prior regional implementation of this program referenced above. General EDs were defined as EDs staffed by board-certified emergency medicine physicians that concurrently care for children and adult patients in the same department. No general EDs had participated in prior ImPACTS or other hub- and-spoke collaboration to improve pediatric readiness preceding this study.

Study Protocol

The study was designed as a pediatric readiness improvement intervention involving national dissemination of prior regional work. The methods for the regional program are described in detail in a prior report, and modifications related to this protocol are described here.[8] Each participating pediatric academic medical center recruited a minimum of 1 general ED to collaborate with over a 6-month period. The collaboration involved 3 phases: (1) a baseline on-site assessment; (2) pediatric readiness interventions; and (3) a follow-up on-site assessment (**Figure 1**, A). The study was conducted over 24 months.

Recruitment and Training of Hubs. Prior to enrolling general ED, all participating academic medical centers lead investigators and research coordinators underwent a train-the-trainer session to ensure a standard execution of the study protocol. These sessions were conducted in-person by the study principal investigators through site visits to the academic medical center. The training session included conducting the simulation sessions in the ED, completing the data collection instruments, data entry into a centralized online database, conducting a report out, and training all academic medical center investigators on the components of the WPRS measurement process. The academic medical

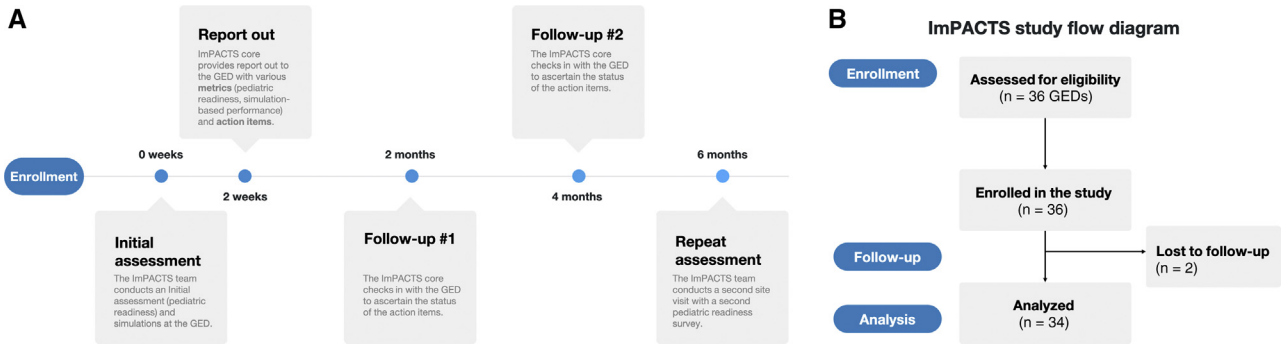

Figure 1. Intervention timeline and study flow diagram. **A,** CONSORT flow diagram of the study. **B,** Targeted timeline for each general ED enrolled in the study. This consisted of an initial assessment at 0 weeks, report out at 2 weeks, follow-ups at 2 months and 4 months, and a final assessment at 6 months.

center teams included healthcare providers with a background in pediatric emergency medicine and high-fidelity simulation. Academic medical center team members could include pediatric emergency physicians, pediatric critical care physicians, pediatric hospital medicine physicians, nurses, respiratory therapists, medics, and nurse practitioners. Each academic medical center agreed to identify general EDs to participate on a voluntary basis and commit to executing all elements of the intervention.

Recruitment of Spokes. Each general ED identified a nurse and/or a physician pediatric "champion" to serve as the site contact and to coordinate all phases of the study with the academic medical center team. If the spoke already had a PECC, as designated by the EMSC, they were encouraged to function in the champion role. Each spoke (general ED) signed a letter of agreement, which outlined the program mission/vision and set expectations prior to enrollment.

Study Phases

Baseline On-Site Assessment. Each academic medical center conducted a baseline in-person site visit at each collaborating general ED that included a pediatric readiness survey and a simulation-based assessment as described in our prior work. The pediatric readiness survey consists of 6 domains outlined in the NPRP: (1) administration and coordination of care; (2) physician/nurse staffing; (3) quality improvement; (4) patient safety; (5) policies, procedures, and protocols; and (6) equipment, supplies, and medications. The survey was completed for each general ED by the academic medical center study team by directly examining all the scored items on the checklist across the 6 domains (eg, locating each piece of equipment, reviewing policies/guidelines in paper or electronic form, reviewing staffing). If during this assessment, the general ED champion and study team were unsure or unable to locate the scored item, no credit was given for that item.

The baseline assessment also included an in situ simulation-based session conducted to assess the processes of care provided by general EDs and to help identify areas for improvement. Recruitment of providers was performed by a designated liaison at each general ED via an e-mail sent to all staff 1 month prior to the simulation, and a sign-up document distributed weekly until the maximum number of participants had volunteered. Each session consisted of 4 standardized scenarios conducted back-to-back in the following order: (1) infant foreign body; (2) infant sepsis; (3) infant hypoglycemic seizure; and (4) child cardiac arrest. The foreign body session was a designated warm-up case for each team to become familiar with the simulation environment and the specific function of the simulator. Details of the simulation setup and cases have been published in our previous work[8,9,11] and are available on our website https://www.impactscollaborative.com/.

Pediatric Readiness Interventions

The intervention phase was conducted over 6 months and included the following: (1) customized performance report; (2) pediatric resources toolkit; and (3) ongoing interactions.

Customized Performance Report. Within 48 hours of completing the baseline visits, each academic medical center team entered the simulation-based performance and WPRS data into a secure, centralized online database. These data were compiled to derive benchmarking data of all ImPACTS participating EDs and customized performance reports of each participating general ED.

Within 2 weeks of the baseline on-site assessment, each academic medical center team scheduled a follow-up meeting with the general ED (via teleconference, phone, or in-person) to review the performance with the general ED champion and other key stakeholders (medical director, nursing director, nurse educator). During this meeting, the academic medical center presented a customized report to general EDs that included their site's WPRS, simulation-based performance, and latent safety threats identified at the baseline assessment. At the end of the meeting, the timeline of the project and expectations of the general ED were

reviewed. In addition, the academic medical center facilitated a discussion with the general ED team to select areas of focus for their six-month pediatric readiness improvement "action item." After the meeting, the general ED champion received a copy of the performance report and a bundle of collated clinical and educational resources to support their efforts to improve pediatric readiness related to their selected action item. An example of a report-out with action items is in **Appendix 2** (available at www.jpeds.com).

Pediatric Resources Toolkit. Participating general EDs were also provided with online access to a bundle of resources to help their champion and leadership team guide pediatric readiness improvement initiatives. This included educational and clinical guidelines as well as resources focusing on managing acute illnesses in children presenting to the ED. Resources were developed based on a gap analysis of deficiencies noted during previous ImPACTS simulated sessions and are available at https://www.impactscollaborative.com/resources.

Ongoing Interactions. Following the performance report meeting, 2 additional "check-in" interactions were scheduled at 2 months and 4 months after the baseline assessment (via a conference call or on-site visit). These check-ins included updates on their readiness improvement process, difficulties encountered, or additional general EDs needs identified. During these check-ins, the academic medical center team provided ongoing oversight, coaching, and guidance. Apart from scheduled check-ins, all general ED champions were encouraged to contact directly the academic medical center liaison for any needs throughout the study.

Follow-Up On-Site WPRS Assessment. The academic medical center team conducted a follow-up WPRS assessment at the general ED 6-9 months after the initial assessment using the same methodology. Simulation sessions were not repeated in the follow-up assessment.

Measures

Pediatric readiness was derived from the Pediatric Readiness Survey and reported as the WPRS. The WPRS is a summary score that weights 24 of the 55 questions on the Pediatric Readiness Survey 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.

Simulation-based performance measures as an assessment methodology have been described in our previous work.[8] Briefly, these measures were iteratively developed over 6 months, and content validity evidence was provided through the adaptation of existing guidelines and a modified Delphi review process.

Statistical Analyses

All data were collected with Qualtrics and entered by each academic medical center lead (Qualtrics International, Inc) and transferred into SPSS v 22.0 (IBM Corp, Armonk, New York) with which all statistical analyses were performed. WPRS scores were compared at baseline and postintervention using paired *t* tests; the WPRS subscores, which were not normally distributed as assessed by Shapiro-Wilk tests, were compared with Wilcoxon signed-rank tests. Descriptive statistics using means and SEs were used to report simulation-based measures, which were normally distributed as assessed by Shapiro-Wilk tests.

Sensitivity analyses were conducted with the adherent general EDs (ie, completed all parts of the intervention in the expected time frame) compared with nonadherent general EDs. We examined differences in WPRS scores by pre- and postintervention scores using bivariate analyses. Data were examined for normality and homogeneity in each analysis.

We tested variables associated with sustained improvements in WPRS using linear regression to model improvement in WPRS (from the baseline assessment to follow-up assessment) as the dependent variable and the number of protocol adherence elements as the independent variable. A site was considered adherent if it completed a report out or follow-up in the correct time frame (a report out in weeks 0-4 after the baseline assessment; the first follow-up between weeks 8 and 12; the second follow-up between weeks 16 and 20; and the final follow-up between weeks 24 and 32).

Results

General ED Characteristics and Baseline Simulation Scores

Thirty-six general EDs participated in the study, and 34 (94%) completed the intervention. A study flow diagram is presented in **Figure 1**, B. The majority (58%) of EDs were low (<1800 annual pediatric visits) or medium (1800-4999 annual pediatric visits) pediatric volume EDs. Eight EDs (22%) were medium-to-high pediatric volume EDs (5000-9999 annual pediatric visits), and 7 EDs (19%) were high pediatric volume EDs (≥10 000 annual pediatric visits). Four EDs (11%) were located in Canada, and the rest were in the US. The ED characteristics are presented in **Table I**.

The mean simulation scores (out of 100) for each simulation case were (percentage adherence to guidelines (SEM)): foreign body obstruction (68.2 [3.4]); sepsis (49.1 [2.3]); seizure (69.0 [2.9]); and cardiac arrest (72.5 [2.2]) (**Table I**).

WPRS Scores

The mean improvement in WPRS scores was 16.3 (95% CI 12.7, 19.8, $P < .001$), from a baseline mean WPRS of 62.4 (SEM = 2.2) to a postintervention mean WPRS of 78.7 (SEM = 2.1) (**Figure 2**, A). General EDs in the lower median of baseline WPRS scores had a significantly higher mean WPRS improvement compared with the higher median of baseline scores (mean improvement: 7.8, 95% CI 1.1, 14.6, $P = .024$).

Table I. General ED characteristics

Variables	N = 36 (%)
Volume	
Low (<1800 annual pediatric visits)	9 (25%)
Medium (1800-4999)	12 (33%)
Medium-to-high (5000-9999)	8 (22%)
High (≥10 000)	7 (19%)
Geography	
California	2 (6%)
Canada	4 (11%)
Connecticut	4 (11%)
Florida	3 (8%)
Indiana	4 (11%)
Minnesota	1 (3%)
New Hampshire	2 (6%)
New York	2 (6%)
Ohio	4 (11%)
Pennsylvania	4 (11%)
Rhode Island	1 (3%)
Texas	1 (3%)
Washington	1 (3%)
Simulation-based adherence to guidelines	
Mean foreign body score % (SEM)	68.2 (3.4)
Mean sepsis score % (SEM)	49.1 (2.3)
Mean seizure score % (SEM)	69.0 (2.9)
Mean cardiac arrest score % (SEM)	72.5 (2.2)
Total simulation-based score, % (SEM)	64.4 (1.2)
Completed intervention (has second WPRS score)	34 (94%)

There were significant improvements in several of the WPRS subcomponents, including administration and coordination of care (median baseline 50 [IQR 0, 50] to median postintervention 100, $P < .001$); policies, protocols, and procedures (median baseline 47 [IQR 34, 67] to median postintervention 65 [IQR 46, 80], $P = .019$; and quality improvement (median baseline 79 [IQR 0, 93] to 93 [IQR 79, 100], $P = .031$. There was little improvement in other subcomponents such as staffing, patient safety, and equipment, supplies, and medication (Figure 2, B).

Protocol Adherence

Six general EDs (17%) were fully adherent to all elements of the protocol timeline ie, had (1) a report out in weeks 0-4 after the baseline assessment; (2) the first follow-up between weeks 8 and 12; (3) the second follow-up between weeks 16 and 20; and (4) the final follow-up between weeks 24 and 32. Twenty-one EDs (58%) were adherent to the report out, 13 EDs (36%) were adherent to the 2-month follow-up, and 15 EDs (42%) were adherent to the 4-month follow-up, and 19 EDs (53%) were adherent to the final follow-up. Two general EDs did not complete the study interventions beyond the report out and the first follow-up; therefore, their follow up WPRS was not included in this analysis. (Table II and Figure 3, A [available at www.jpeds.com]).

There was no association with adherence to the protocol timeline and improvement in pediatric readiness; in protocol adherent general EDs, there was a mean 17.1-point improvement in WPRS, whereas the nonadherent EDs showed a mean 12.2-point improvement in WPRS ($P = .291$). There was also no linear relationship between protocol adherence (on a scale of 0-4) and WPRS improvement, $r^2 = 0.021$, $P = .690$ (Figure 3, B). In addition, there was no correlation between the simulation scores and the WPRS scores. The Pearson correlation between the simulation score and baseline WPRS score was 0.010 ($P = .955$) and for the simulation score and follow-up WPRS score was 0.229 ($P = .192$).

Discussion

This was a prospective, multifaceted improvement initiative involving collaboration among a diverse group of general EDs with regional pediatric academic medical centers to

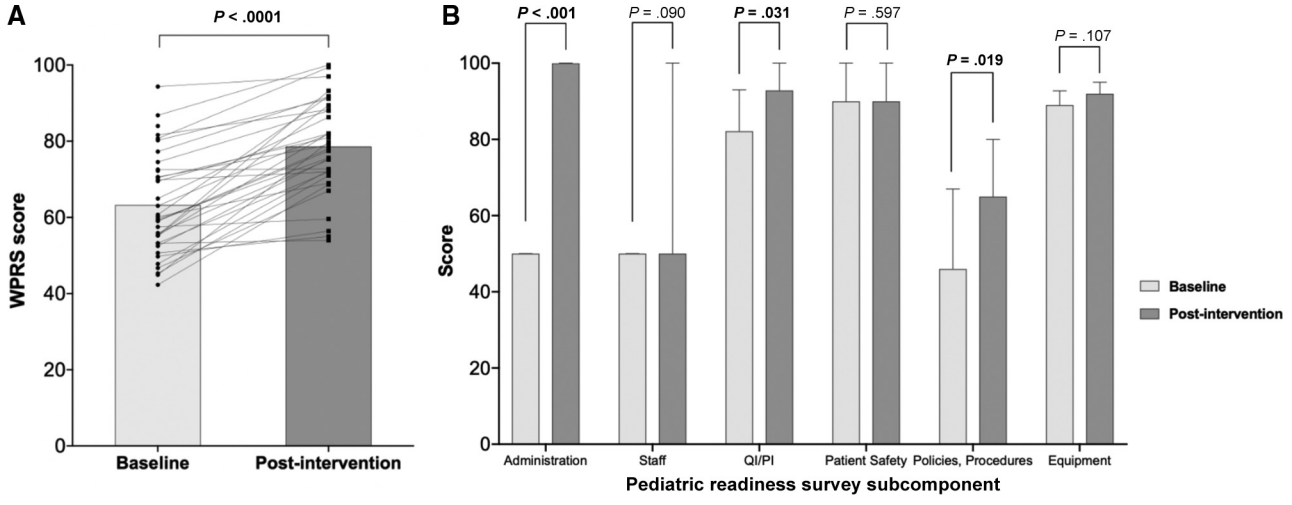

Figure 2. Improvement in WPRS. **A,** Changes in mean WPRS scores between baseline and postintervention. Individual dots represent the same ED between both assessments. The *P* value was calculated with a paired t test. **B,** Changes in median pediatric readiness survey subcomponents between baseline and postintervention. Bars represent IQRs, and *P* values were calculated with Wilcoxon ranked-sum tests.

Table II. Adherence with the protocol

Adherence/completion	Report out N = 36 N (%)	First follow-up N = 36 N (%)	Second follow-up N = 36 N (%)	Final follow-up N = 36 N (%)	All N = 36 N (%)
Complete-adherent	21 (58%)	13 (36%)	15 (42%)	19 (53%)	6 (17%)
Complete-nonadherent	15 (42%)	23 (64%)	19 (53%)	15 (42%)	28 (78%)
Incomplete-nonadherent	0 (0%)	0 (0%)	2 (5%)	2 (5%)	2 (5%)

improve pediatric readiness. This intervention showed several key results in a cohort of 36 general EDs: (1) there was a significant 16.3-point improvement in WPRS; (2) the largest improvements in pediatric readiness were demonstrated in the domains of coordination and administration of care; policies, protocols, and procedures; and quality improvement; and (3) adherence to the study protocol timeline was variable across sites but was not associated with the degree of improvement in pediatric readiness.

The Pediatric Readiness Survey is an important tool to measure pediatric emergency readiness. The WPRS has been used to compare care across a healthcare system[17] and to study access to care,[18-20] and more recently to relate WPRS scores to patient outcomes. Recent studies examined the relationship between pediatric readiness and mortality in children and found a significant relationship between higher pediatric readiness scores and lower in-hospital mortality.[6,7]

Sustainable strategies are needed to improve emergency care for children. Our findings have important implications for pediatric emergency care across general EDs in the US, where the majority of pediatric emergency care is delivered. Primarily, we demonstrated that pediatric emergency readiness can be improved across general EDs through a collaborative network providing shared resources and best practices to promote high quality pediatric care and enhance emergency preparedness. As described in previous studies, the most common reasons for low WPRS in EDs are lack of implementation of policies and procedures, lack of quality improvement initiatives, and the absence of dedicated PECCs.[5,21] Our collaborative was successful in addressing these domains in particular, which has a high likelihood of impacting the quality of care provided in general EDs.

Our intervention used the central role of a pediatric champion or PECC in the general EDs to promote pediatric readiness. The Institute of Medicine recommends that EDs designate PECCs to provide oversight of emergency care services to children and to integrate and promote pediatric-specific education, policies, and procedures.[22] In this study, participating general EDs agreed to designate a pediatric champion (analogous to a PECC) at their site to help coordinate study activities and implement quality improvement initiatives. Champions were either a physician or a nurse provider who had a special interest and/or skillset in the emergency care of children in their own ED and functioned as PECCs throughout the improvement process. The impact of these champions was seen in multiple domains, but most pronounced in the domain of administration and coordination of care domain; highlighting the central role of the PECCs in promoting pediatric readiness. In addition, in this study, we believe that simulations served as a platform to help engage general ED providers and teams by providing them with real-time pediatric experiences and opportunities for reflective discussions. Simulation-based assessment allowed for measurement of team performance in their ED and identification of targeted areas for improvement. Furthermore, it allowed for a high-level engagement of ED leadership and promoted relationship building with each other and regional children's hospital on shared goals of optimal pediatric care. Finally, in our reports to the EDs, we included data from pediatric EDs that served as a benchmark for community EDs to achieve higher scores.[8]

The majority of general EDs in this study lacked adherence to the protocol timeline, with only 17% of participating EDs adhering completely to the protocol timeline. Despite that, there was no association between adherence to the protocol timeline and improvements in WPRS. In addition, 2 sites did not complete the study intervention given turnover in their administrative roles and the lack of a dedicated champion to carry on the ongoing effort throughout the study interventions. This highlights the importance of the collaborative improvement efforts to address general ED pediatric readiness. In this initiative, all participating general EDs leadership along with the designated champions were involved in the improvement efforts and completed the protocol elements, which most likely contributed to the improvement seen in the WPRS regardless of the poor adherence to the protocol timeline. This is likely representative of differences between the general EDs' existing capabilities and resources to engage in pediatric readiness efforts and underscores the need for flexibility when engaging general EDs in these efforts. This also suggests that efforts to improve general ED readiness should be tailored to each site's needs to enhance the likelihood of success.

Disparities in pediatric emergency readiness, processes of care, and patient outcomes exist across EDs in the US.[3,5,8] Many initiatives to address these disparities have been developed over the last 2 decades and include local[23] and statewide[24] collaborations providing resources and share guidelines and best practices to optimize pediatric readiness. One example is pediatric facility recognition programs that are led by the EMSCs Education Innovation and Improvement Center. Pediatric Facility Recognition programs are based on national guidelines to ensure the availability of

appropriate supplies and medications, the presence of transfer agreements, and the sharing of treatment guidelines between all facilities within the program.[25] EDs recognized through these programs have higher pediatric readiness,[26] and the pediatric facility recognition program in Arizona showed trends toward lower mortality for children treated in recognized EDs.[27] Our model of collaboration with regional children's hospitals serving as hubs to support local participating community EDs is complementary and generally aligned with the EMSC pediatric facility recognition program. Our framework of connecting the academic medical centers and the community EDs in their region is based on a shared mission of ensuring optimal emergency care of children whenever and wherever it is needed.[28] Another Education Innovation and Improvement Center initiative, the National Pediatric Readiness Quality Collaborative, created regional networks of >150 training ED sites working to improve pediatric emergency care through compliance with 4 specific elements of the joint policy statement. Several state initiatives led by pediatric academic medical centers have utilized simulation to improve pediatric readiness and quality of care in general EDs measured in simulated settings for high acuity conditions.[12,13,15,16] Our findings mirror other national, statewide, and local initiatives that have improved the day-to-day pediatric readiness and promoted the quality of care provided in general EDs.

Our study has several limitations. First, our recruitment approach may have led to selection bias because participating general EDs were recruited by their regional pediatric academic medical center without randomization. To mitigate that, we recruited general EDs with varied pediatric patient volumes from different regions in the US and Canada to allow for a better representation of general EDs. Second, the Pediatric Readiness Survey has limited validity evidence; however, this is the most validated tool to date to assess pediatric readiness and is broadly supported by the American Academy of Pediatrics and the American College of Emergency Physicians. Third, we did not measure the improvement in the simulation-based performance in general EDs because the goal of this initiative was to improve the WPRS. Fourth, the participating general EDs were aware that they were participating in a pediatric improvement intervention and this likely led to a Hawthorne effect. Last, we cannot link the significant improvements in WPRS in general EDs to actual patient care processes or outcomes. However, with the evolving evidence of the association between WPRS and patient outcomes, improvements in pediatric readiness in general EDs can potentially impact downstream clinical care and patient outcomes, but future well-controlled studies are needed to examine this important question.

This study demonstrates that a collaborative intervention model is associated with improvement in pediatric readiness when disseminated to a diverse group of general EDs partnering with their regional pediatric academic medical centers. These findings are consistent with improvements in WPRS noted in prior work and provide evidence that innovative collaboration led by pediatric academic medical centers can serve as an effective strategy to improve pediatric readiness in general EDs nationwide. Future work is needed to examine the effects of these improvements in WPRS on clinical care and patient outcomes. ■

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Reprint requests: Kamal Abulebda, MD, FAAP, Department of Pediatrics, Division of Pediatric Critical Care, Riley Hospital for Children at IU Health, 705 Riley Hospital Dr, Phase 2, Room 4900, Indianapolis, IN 46202-5225. E-mail: kabulebd@iu.edu

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Appendix 1

Additional ImPACTS Investigators

Riad Lutfi, MD[1], Samer Abu-Sultaneh, MD[1], Zachary J Berrens, MD[1], Brian Burns, DNP[2], Jennifer Reid, MD[2], Sara Fenstermacher, ARNP[2], Megan Lavoie, MD[3], and Khoon-Yen Tay[3]

From the [1]Division of Pediatric Critical Care Medicine, Department of Pediatrics, Indiana University School of Medicine and Riley Hospital for Children at Indiana University Health, Indianapolis, IN; [2]Department of Pediatrics, Division of emergency Medicine, University of Washington School of Medicine, Seattle, WA; and [3]Department of Pediatrics, Division of Emergency Medicine, The Children's Hospital of Philadelphia at the University of Pennsylvania Perelman School of Medicine, Philadelphia, PA.

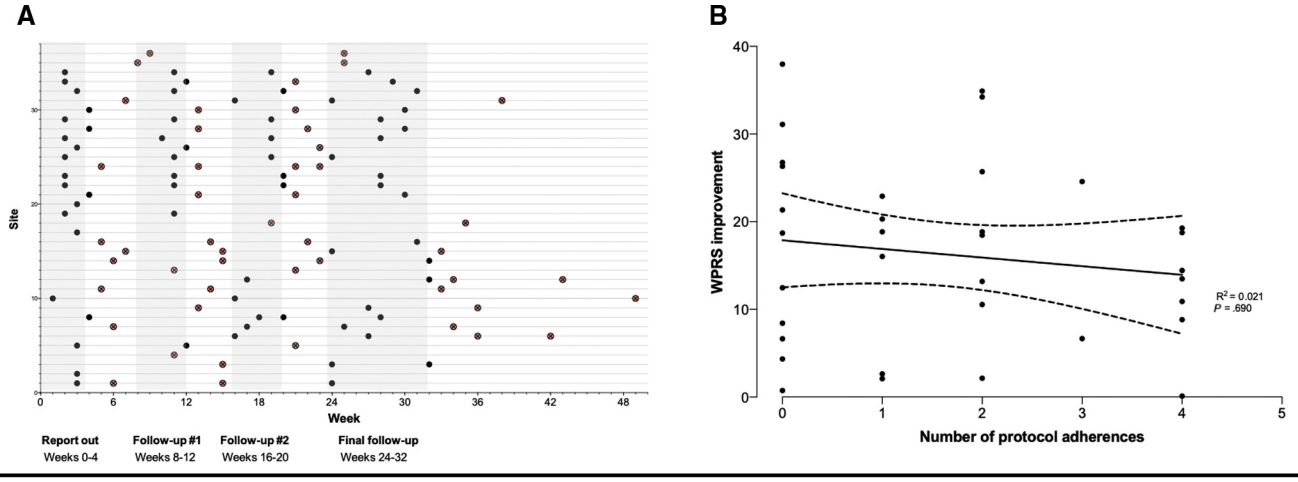

Figure 3. Protocol adherence. **A,** A site was considered adherent if it completed a report out or follow-up in the correct time frame (a report out in weeks 0-4 after the baseline assessment; the first follow-up between weeks 8 and 12; the second follow-up between weeks 16 and 20; and the final follow-up between weeks 24 and 32). Shaded blue regions indicate the correct time frames. The *y*-axis represents each individual site. Dots are colored red with an "x" if they did not complete the report out or follow-up in the correct timeframe. **B,** Linear regression model with WPRS improvement as the dependent variable and number of protocol adherences as the independent variable.