

## TITLE

### **Background**

There has been considerable growth in the number of emergency departments (ED) and ED patient visits in the United States over the past two decades. EDs in the United States are disparate in their readiness to provide care to ill and injured children. The majority of Academic Medical Centers have high levels of pediatric readiness, as many of their EDs are designed and operated solely for the care of children. These “pediatric” EDs care for 100-250 children per day. Paradoxically, only 10% of all children’s ED care is provided in these Academic Medical Centers. When a child is ill or injured, care is most often provided to them in a community ED near where they live or attend school. There are over 4500 community EDs nationwide that care for 5-25 children per day. These EDs are staffed by providers with limited pediatric experience and somewhat limited resources making them less prepared to care for the severely ill child.

Academic Medical Centers (AMCs) with specialized pediatric providers are committed to ensuring optimal health outcomes for all children in the US. In order to achieve this goal, Academic Medical Centers need to expand their “net” beyond their four walls to support community hospitals and maintain a continuum of care starting with the community ED. This must be balanced with respect for the desires and needs of the community hospital providers and leaders.

ImPACTS (Improving Pediatric Acute Care through Simulation) is a research and education network that aims to improve pediatric readiness in the United States. The ImPACTS “model for improvement” involves collaboration between academic medical center “HUBS” and community hospital “SPOKES”. Each community hospital will designate a pediatric champion to participate in the ImPACTS program. These community pediatric champions will lead their EDs pediatric readiness improvement

effort over six months, with support from the AMC HUB and ImPACTS coordinating center.

The intervention begins with an in person pediatric readiness assessment day. This assessment involves a survey of the ED as well as a simulation-based assessment of the quality of care delivered to a series of simulated patients in the resuscitation bay of the community ED. A performance report and gap analysis will be generated from the survey and simulation data by ImPACTS team. This report will provide each community ED with a quantitative pediatric readiness performance report as well as a comparison of their readiness to other EDs. This readiness performance report will be reviewed by the participating community ED and academic medical center through a “report out” within two weeks of the readiness assessment day. The “report out” meeting will involve presentation of the data to the ED leadership team. After this presentation the group will select two high priority “ImPACTS action items for improvement”. Action items will be specific, measurable, realistic, and time sensitive. Each of the action items will be linked to an “ImPACTS action plan” that includes resources and an explicit timeline of two months for completion of the individual action items. Every two months the spoke and hub teams will interact to review the progress of the action items. These interactions will address any of the issues impacting the successful completion of the actions items and the pediatric readiness scores. When an item is completed the team will select a new high priority “ImPACTS action item” from the initial list. At the end of the six-month period a follow-up pediatric readiness assessment day will be completed. The ImPACTS core team will create an updated report out including an updated the gap analysis as well as a summary of the action items completed. The participating academic and community sites will engage in discussions related to future directions for the collaborative during this final report out. The ImPACTS core will provide administrative support participating to hub and spoke sites. The goal of this collaborative is for each of the participating community EDs to complete the action items and improve the hospital’s pediatric readiness score by 10%.

Examples of action item/plan for improvement:

	Action Item	Action Plan
Priority example 1	Use of kilograms only in weighting pediatric patients	<ul style="list-style-type: none"> <li>- Implementing and integrating weight-based medication regimen in hospital ED's EMR</li> <li>- Demonstrating the use of it in actual patients</li> </ul>
Priority example 2	Push/pull action plan	<ul style="list-style-type: none"> <li>- Create a push/pull kit</li> <li>- Determine appropriate location to store kit</li> <li>- Push/pull video</li> <li>- Demonstration of nurse's competency and a sign off</li> </ul>
Priority example 3	Use of pediatric guidelines in managing pediatric DKA	<ul style="list-style-type: none"> <li>- A didactic about pediatric DKA</li> <li>- Distributing and implementing the pediatric DKA guidelines through ED</li> </ul>

**Specific Aims:**

**Aim 1:** To improve the pediatric readiness of participating community EDs.

H1: An improvement in pediatric readiness, measured by the National Pediatric Readiness Project's Pediatric Readiness Score, will be noted between the first and final measurement.

**Aim 2:** To improve the structure and processes of pediatric care provided in community EDs by completing action items for improvement in the study period.

H2: Hospitals will complete action items provided to them in this study over the expected time period.

**Exploratory Aims:**

Quantitative: To describe the frequency of outgoing and incoming interactions between spoke/hubs and factors associated with success/failure in completing action plans.

Qualitative: To describe barriers to completing action items.

**IF FEASIBLE AT SITES: Aim 3:** To improve the structure and processes of pediatric care provided to a series of simulated pediatric patients.

H2: An improvement in the structure and processes of care delivered to simulated patients, measured by simulation-based performance on standardized checklists, can be observed between the first and final measurement.

**Inclusion/Exclusion Criteria:**

Inclusion criteria:

- “Hub” Academic Medical Centers will be recruited to participate and include a hospital with pediatric emergency and intensive care specialties as well as a pediatric residency training program. Sites will be required to complete a train-the-trainer session and submit a letter commitment to enroll at least two community hospitals within one year.
- “Spoke” Community hospital emergency departments that care for patients of all ages. EDs will be categorized by the number of pediatric patients they care for each year: high volume (>10000) medium-high volume (5000-9999), medium (1800-4999) and low volume (<1800). Additional commitment letters from each community site will be submitted by the “hub” after scheduling the assessment and follow-ups.

**Enrollment:**

Spoke and HUB sites will voluntarily join ImPACTS through a set of collaborative agreements (between spoke and “ImPACTS core” as well as two hubs with core).

The ImPACTS core will provide a standardized protocol (turnkey approach) for spokes to collaborate with hubs. Participating community sites will have access to quality

improvement and educational content that can be shared by the HUB with each participating community site. The goal of this to have all the needed resources, guidelines and policies readily available in a centralized folder that can be accessed by Hub and spokes sites at anytime. IF certain resources are needed but not available, the ImPACTS core will help obtaining them and coordinate with the hub site accordingly. This project will not involve randomization.

### **HUBs recruitment, collaboration and standardization**

Participating hubs will join ImPACTS through a formal collaboration agreement. The HUB will complete training with the “ImPACTS core” using “Train the Trainer” to ensure standardization in the structure and process of this intervention. HUB team should include health care providers with a solid background in pediatric emergency medicine and high-fidelity simulation. The team may include but not limited to: pediatric emergency physicians, pediatric critical care physicians, Nurses, respiratory therapists and nurse practitioners. Each HUB will be provided a turnkey approach to collaborating with community sites including QI/PI/clinical practice/education. Each HUB will identify at least two Community EDs will participate on a voluntary basis and commit to participating in all elements of the program. The community ED to liaise with the HUB team will identify a nurse and/or physician pediatric champion(s). If the community ED has a Pediatric Emergency Care Coordinator (as designated by EMSC) they will be encouraged to function in the liaison role). This individual will coordinate the in person pediatric readiness survey assessment, the simulations and all follow-up interactions with the HUB upon the initial agreement.

### **Spoke recruitment**

The HUB sites collaboration with the spokes will involve discussions about the program vision and mission and set the expectations from each spoke site in addition to having the commitment letter signed upon agreement. Initial agreement will be performed between the HUB Liaison and the spoke medical director. Subsequently, after an individual has been identified at the community hospital as a “ED champion” to serve as the site contact

the ImPACTS model involves the academic medical center team working with that individual to arrange for a site visits and subsequent communications. ImPACTS core will provide support to all HUB sites throughout the recruitment process and consultation with the core experts regarding the initial recruitment.

## **Study Phases**

### **1- Initial Pediatric Readiness and Quality Assessment (Time 0)**

This initial site visit involves the HUB team going to each participating community hospital to conduct an in person “pediatric readiness survey” and a series of in-situ simulations.

- I. *Pediatric Readiness Survey*: The liaison from the HUB will visit each community ED site and use the Pediatric Readiness Survey to document a pediatric readiness score (Appendix 1). All items on checklists will be examined in person with the community ED “champion”. If Community ED point person unsure or unable to identify item, it will count as non-existent.
  
- II. *In situ simulation(s)*: The HUB team will conduct a series of four simulations; sepsis, cardiac arrest, foreign body aspiration and hypoglycemic seizure (attachment 1). These simulations will involve inter-professional team members using the local policies, procedures, equipment and resources. The HUB team will set up simulation equipment and video equipment in the ED resuscitation bay. The scenarios will be followed by a constructive standardized scripted debriefing session. The collaborative team will answer questions about pediatric readiness related to the scenarios and provide education materials to participants related to the scenarios. Prior to the simulations demographic data and consent for video recording from participating team members will be collected. Teams of providers will be recruited to participate that match each department’s “standard” team structure to include physicians (1-2), nurses (2-5) and technicians (1-2). If

departments have additional team members that are a part of their standard resuscitation team they will also be invited to participate. Additionally, clinical teamwork scale CTS will be used to assess overall team dynamics and communication during each simulated scenario.

- III. *Data collection:* The HUB team will score each of the team using checklists for each case completed during direct observation and a subset of cases will demonstrate inter-rater reliability/generalizability of the checklist through application by a blinded video reviewer. A standard Clinical Teamwork Scale (CTS) will be used to evaluate teamwork during all simulations. (Appendix 2). The simulation-based performance checklists will be collected on paper forms by the HUB teams and entered into a centralized data collection form in addition to the pediatric readiness scores and CTS within 48 hours of completing the initial visit using the following link:

[https://yalesurvey.qualtrics.com/jfe/form/SV\\_d6UTmoppphESYG9](https://yalesurvey.qualtrics.com/jfe/form/SV_d6UTmoppphESYG9)

## **2- Gap analysis, action items and action plans (Time 1-4)**

This phase will consist of:

### *I. Report outs with action items (Time 1)*

After the simulation at the community site, each HUB will complete the data forms that will go to the ImPACTS core for data analysis within 48 hours of sim session. The ImPACTS core team will transform that content into a standardize “ImPACTS report out” be sent out to the HUB. Additionally, ImPACTS will support the HUB team as they interact with the community site lead to review the report out score and select two action items for the first two months following the call. As these items are completed additional items will be added from the data set.

Each HUB will schedule a conference call or in person visit with community ED within two weeks after the initial site visit. During this meeting with the

community ED champion (and local community ED leadership), HUB team will review the compiled data- including clinical performance, safety threats, readiness scores and discuss opportunities for improvement that came up either during the simulation, debriefing or PRS survey. The site will receive a copy of the report, which will include their pediatric readiness score, simulation performance data as well as action items.

Action items will be prioritized to be completed within the 6 months' time frame following the call. These action items will be SMART (specific, measurable, actionable, realistic and timely). After each action item is complete a new item will be added from the initial list.

The action items will include a detailed plan for improvement. The item will only be considered complete after the measurable evidence as described in the protocol has been provided to the HUB.

Access the ImPACTS library; an online resource of peer-reviewed articles related to pediatric emergency department care will be available for ED sites.

## *II. Outgoing interaction (HUB to community ED) (Time 2-3)*

The HUB site will be supported by ImPACTS core as they work to follow-up with the community EDs. Additional outgoing communications (from HUB to community ED) will be scheduled at 2 months and 4 months using conference call or on-site visit. The discussions will include updates on implementation of action items, any difficulties encountered or educational needs identified.

The HUB will complete a log to document interactions with the community site. The HUB will be responsible to collect evidence of completion of the action item per the protocol (as described for each item) and submit this to the ImPACTS core. After each item is completed the HUB will provide the site with an additional item from the list. Incoming interactions (from community ED to HUB) will be encouraged and will happen based on the need of each community ED for further assistance or input from the HUB. These interactions will be

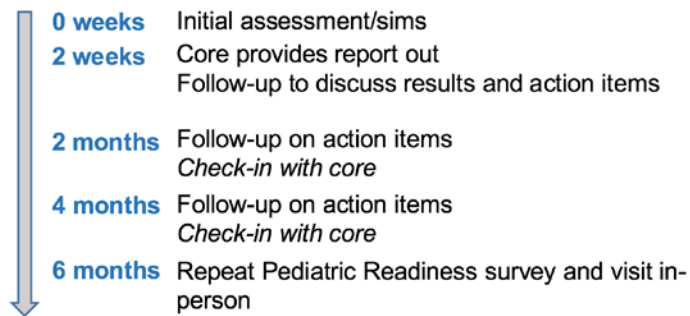


tracked and logged using the same log to document all interactions.

### *III. Repeated follow-up in-person visit (Time 4)*

A follow-up visit to the community EDs conducted by the same methods as described above (HUB liaison + ED champion) to provide re-assessments of the PRS and simulation-based performance at each ED site at the end of the study period (at approximately six months after the initial simulation).

#### **Expectations and timeline for each community site**



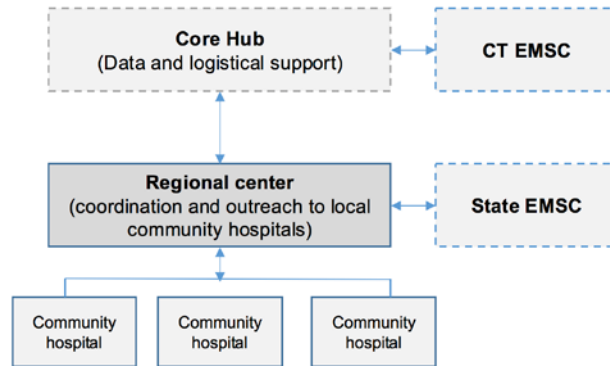
#### ***Project facilities:***

ImpACTS leadership will establish a steering committee that will oversee the process of this project throughout the whole study period. This steering committee will have representatives from ImpACTS Core HUBs in addition to the project manager, community representative and the committee chair.

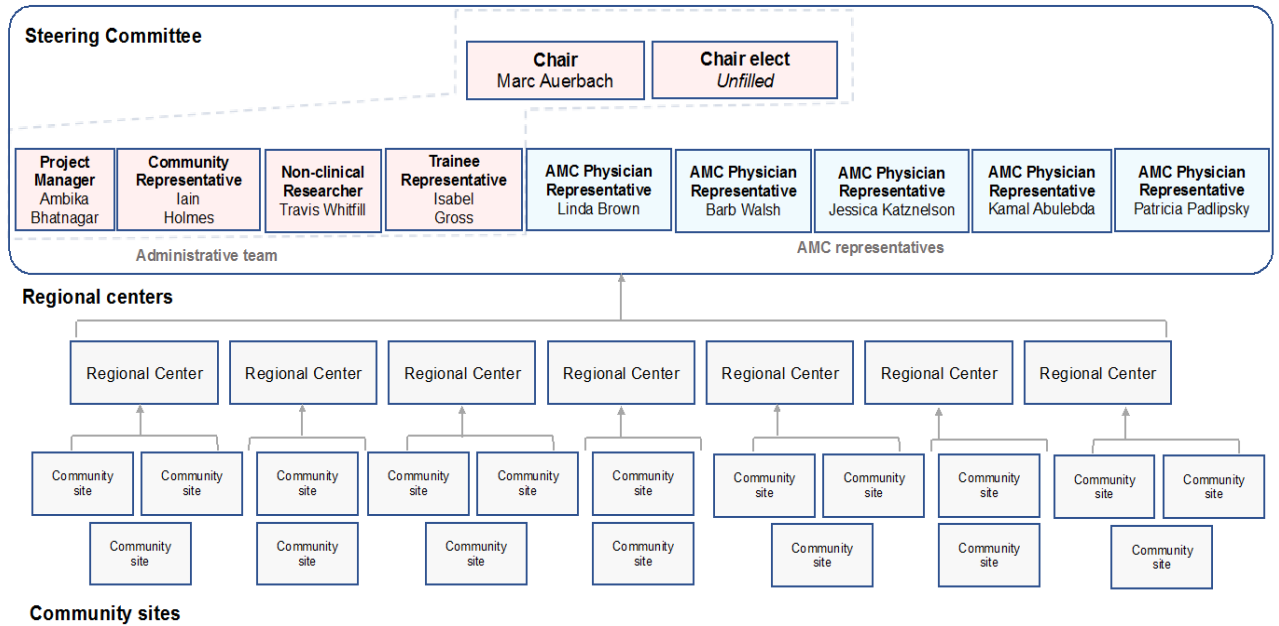
The key to ImpACTS' success is buy-in from regional Academic Medical Centers HUBs that will serve as primary contacts to community hospitals in their regions/states.

Academic Medical Centers interested in becoming “hubs” will participate in a conference call with ImPACTS leadership team on a regular basis. This ongoing communication between the ImPACTS Core and all HUBs will guarantee a standard approach of the project and maintain a line of mutual feedback ongoing support of all regional centers. These HUBs will go to at least two community hospitals in a year to assess their readiness for acute care for children and conduct in situ simulations.

### ImPACTS' structure and relationships



**ImPACTS**  
IMPROVING PEDIATRIC ACUTE CARE THROUGH SIMULATION  
**Organizational structure**



***HUB ImPACTS team:***

The team will be recruited from an academic medical center at each /region state and aims to include providers from different medical backgrounds (EM, ICU and critical transport) and professions (RN, MD, DO, APRN, PA). A minimum of one physician and one non-physician provider are required to participate as a HUB. All faculties will have an extensive training use of high-fidelity simulation mannequins, simulation scenario design, and incorporating constructive critique and debriefing methods. Additionally, all HUBs will complete “train-the-trainer” to understand the ImPACTS model.

**Participant team:** Each team will consist of emergency medicine physicians, residents, nurses, respiratory therapists, pharmacists and others.

**Simulation session:**

A pediatric champion will serve as a liaison for the community site to ensure all the logistics of the simulation day are in order.

Staff expected to participate in the simulation should mimic the site's actual code team. One example would include 1-2 physicians, 3-4 RNs, 1-2 technicians, 1 RT, and 1 pharmacist. Additionally, location of the in-situ simulation needs to be in the resuscitation or trauma room. This ensures more realism and mimics the location where a critically ill child would present. Duration of the day: 2.5 hours per team (up to 4 simulations). Permission to use all the location's equipment including the code cart, Broselow cart, ET tubes, BVMs, and IV supplies.

**Simulators:**

We will use a variety of simulators for the project based on each center's equipment. These will include a 7 kg infant/toddler (SimBaby) and a 20 kg child (SimJunior/Megacode Kid).

**Video:**

All simulation sessions will be videotaped using B-Line Medical "SimCapture". Two camera angles will be required for each case. All videos will be stored in the central memory of B-Line or uploaded to this system if the site uses another method to record video. A random sample of 10% of the cases will be reviewed by a blinded individual to compare the scores to each sites score for the case.

**Continuing education credits:**

Centers may incentivize participation of community EDs hospital providers by offering continuing education credits for the participants. Physicians will be offered continuing medical education (CME) credits. Nurses and respiratory therapists will be offered continuing education units (CEU) as well from each region/state HUB.