

Proceedings of the second Childress Summit on pediatric trauma: Operationalizing the vision

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In April 2013, 56 nationally recognized experts from diverse fields (including pediatrics, surgery, neurosurgery, nursing, psychology, social work, prehospital services, and epidemiology) and representatives from several government agencies met at the Graylyn International Conference Center at Wake Forest University (Winston-Salem, North Carolina) to discuss the current state of pediatric trauma. During the 3-day “Childress Summit,” cohosted by the Pediatric Trauma Society and the Childress Institute for Pediatric Trauma, a consensus emerged that pediatric trauma was a unique and independent discipline, as yet relatively undefined. The group was charged with developing a set of recommendations to help set priorities for future development of the field. These recommendations formed the basis of a report published in the *Journal of Trauma and Acute Care Surgery*.¹

At the time of the 2013 Summit, a follow-up meeting was planned to further develop and operationalize the recommendations. This event, Childress Summit II, was convened in May 2015 at the same location with 48 participants, again from diverse specialties and committed to the advancement of pediatric trauma care. Three specific recommendations that emerged from the first Childress Summit were selected for in-depth development at the second meeting. These recommendations were to

1. create a virtual pediatric trauma center (TC) to help practitioners care for injured children in locations remote from tertiary care;
2. create a pediatric trauma toolkit, a ready resource to develop and distribute educational tools and clinical practice guidelines for better management of pediatric trauma patients; and

3. provide a national “report card” on the status of pediatric trauma to enhance and inform future research.

Participants were assigned to a team to conduct an evaluation of the current status of, and to develop a plan to execute, each concept. Several groups held premeeting conference calls to frame their charges, analyze existing evidence and best practices, and determine the process moving forward. During the discussion, it became clear that there was considerable overlap between the “virtual pediatric trauma center” and “trauma toolkit” concepts. For the purposes of this report, some of these issues will be discussed together. In addition, teams were encouraged to develop a pilot project related to the overall theme, which could be completed within 2 to 3 years with a relatively modest budget. A graphic recorder was assigned to each group to visually capture key points.

Other salient themes and recommendations from the first meeting were incorporated into the framework of The Childress Summit II. For example, in response to the recommendation to translate lessons learned in the military medical system, two teams had participants from the military. Teams were also keenly aware of the importance of placing a greater emphasis on the family during and after hospitalization, and many of the proposed deliverables were targeted to the family directly. In this report, the work products of the teams are reviewed and intentionally worded as a proposal for future action. Graphic recorders assigned to each team created the illustrations.

A VIRTUAL PEDIATRIC TRAUMA CENTER

Overview

The available evidence indicates that children receive the best care at pediatric TCs. For the foreseeable future, however, time, distance, and cost barriers guarantee that pediatric patients will frequently arrive at adult-oriented centers requiring time-critical diagnosis and treatment, even if later transported to a pediatric specialty center. Adult-oriented centers generally lack expertise specific to pediatric considerations. They often lack dedicated pediatric trauma experts and pediatric equipment and supplies and integrative services such as child life. Small pediatric trauma patient volumes may influence a lack of time, money, or motivation to address these gaps. Thus, it is crucial to incorporate specialized expertise from elsewhere in the trauma system to improve treatment and outcomes for pediatric trauma patients. The challenge is to overcome distance and cost barriers to quickly transfer available expertise from where it is located to where it is needed. The concept of a virtual pediatric trauma center is crucial to meeting that challenge.

Published online: August 2, 2016.

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The Childress Institute for Pediatric Trauma, Winston-Salem, North Carolina, provided the financial support for The Childress Summit II. Graphic recorders provided illustrative storytelling through Tremendousness, Inc. (www.tremendo.us), to help explain complex ideas and processes during the summit. Examples of these illustrations are included in the manuscript.

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DOI: 10.1097/TA.0000000000001197

J Trauma Acute Care Surg
Volume 81, Number 4

Virtuality

Virtuality is the quality of having the essential attributes of something without requiring its physical presence. With current wireless technology and ubiquity of mobile devices, the limitations of distance from important resources (e.g., experts) can be overcome by establishing virtual bidirectional interactions at any time of day, from any location. Modern computer software, image presentation and processing, and electronic communication capabilities now enable powerful environments for discussion, problem solving, education, and resource sharing.

What Would Have the Greatest Impact?

One might envision a virtual “pediatric specialist in your pocket,” a telepresence service that finds and connects available specialists for real-time consultation at any point during treatment. Early prototypes exist where Level I pediatric TCs provide outreach and quality improvement guidance for verified Level 2 or 3 pediatric TCs.² There are challenges nevertheless. First, specialists at tertiary pediatric TCs are already overtaxed and will need to know when they are needed. Second, on-site personnel may not recognize when consultation is desirable. The “virtual” group recognized that a better understanding of rural community needs and capabilities will be needed, before more sophisticated targeted intervention can be developed.

Needs Assessment of Rural Health Care Providers

Overview

Acute care management of injured children in rural environments includes ongoing phases of care. The most severely injured patients should be transferred to a TC as soon as possible. However, less severely injured children could benefit by remaining in their community, with treatment augmented by telemedicine and virtual resources as needed. Telemedicine, although common in other medical specialties, presents unique challenges with pediatric trauma cases, which are by definition both unplanned and urgent. Individual hospitals may have very little experience with injured children. Therefore, before implementing a virtual system, a needs assessment of a representative sample of hospitals is required.

Methodology

The focus of this outreach will be critical access hospitals (CAHs) in rural areas. A CAH is federally defined as a hospital of 25 beds or less that is at least 35 miles away from the nearest facility. Before developing virtual intervention targeting rural hospitals, individual hospitals will be engaged to identify what support they would need to participate in a virtual trauma network (VTN). Anticipating a range of expertise from verified Level IV American College of Surgeons TCs to hospitals with limited trauma expertise, any partnership should grow in a staged process to build trust and enact behavioral changes to improve services available to injured children. For example, staff at a Level IV TC should already be capable of resuscitating and stabilizing a trauma patient for transport to a higher level of care but might lack the experience needed to manage a child. A CAH that is not also a TC will have much more comprehensive needs.

We propose key informant interviews with a representative sample of CAHs, chosen by a stratified cluster design. The interviews will be performed in a semistructured fashion by a trained investigator, and hospitals will self-identify the most appropriate participants for the interview process. Target hospitals will be defined by geographic regions and stratified by whether they are in a state that participates in an “inclusive” or “exclusive” trauma system. Domains will include their perceived key metrics of success, resources, and need for follow-up care, defining the modality that works best in the CAH environment. We will explore areas of development such as assessment, diagnosis, treatment, and referral of nonaccidental trauma; resources for providers to feel comfortable caring for children (and which age ranges); community-based paramedicine and transport resources; when and why to use radiographic imaging and how to interpret this imaging; and treatment of specific clinical problems such as burns and minor head injury.

Anticipated Results

Self-assessed needs of these rural hospitals will be used to make recommendations to inform and refine approaches to a VTN. A targeted rollout of the VTN based on user needs will create a trusting and interactive partnership to mobilize resources and influence the trauma system to more adequately triage and treat injured children. As the VTN develops, a continuous process of feedback from CAHs will help ensure that the system meets the needs of the targeted audience.

Potential Partners and Funding Sources

This project will be most successful if done in collaboration with other federal and state resources such as the National Pediatric Readiness Project, Emergency Medical Services for Children (EMSC), the Office of Rural Health Policy (all programs within the federal Health Resources and Services Administration [HRSA]), the National Rural Health Resource Center, state Medicaid and trauma offices, and the American College of Surgeons. Potential funding sources include HRSA, EMSC, CMS, Office of Rural Health Policy, and the National Institutes of Health, among others.

Barriers

The remoteness of CAHs is a challenge, and it will be time intensive to travel to and conduct interviews at multiple centers that are, by definition, a significant distance from each other. A way to overcome this is to use already established telehealth sites in states to facilitate virtual interview process. A clustered sample design may increase the efficiency of the process. Key informants within CAHs may need to be reimbursed for their time to increase the likelihood of participation and decrease the potential bias of capturing only the most motivated sites or those already verified as TC.

Long-term Implications

Formal recommendations will be developed to pilot and roll out short- and long-term modules for the VTN. Partnerships will continue to be developed and evaluated with the CAHs. Results from these pilots will also inform further expansion to hospitals outside the CAH system.

Emergency Pediatric Trauma App (*Where Do I Take My Child?*)

Overview

While the rural hospital is one potential target audience of a virtual pediatric TC, a more “grassroots” approach can also be developed. At the most fundamental level, parents are the first “care provider” in any pediatric system. Without intervention, parents are likely to take injured children to the nearest or most familiar medical facility.³ Consequences can range from pain and emotional trauma while waiting for care better provided elsewhere, to avoidable deaths from delays waiting to be seen, diagnosed, and transferred to more suitable care facilities. A recent study showed 16% of injured children were transferred to another hospital, with almost one quarter of these to a facility more than 10 miles away.³ We need to reduce systemic delays to timely care by getting children more directly to appropriate facilities. This effort aims to target the insertion of injured children into the health care system through decision support aids that help parents understand which facilities best fit their child’s needs (urgency level, specialties, equipment, etc.), where they are located, and what characteristics differentiate them (e.g., distance, wait time).

Methodology

We envision a bidirectional, interactive, user-friendly smartphone app that can help parents or guardians quickly describe and self-triage their child’s situation. Immediately life-threatening situations can go directly to a 911 pass-through, whereas minor injuries will trigger links to at-home care management tips. For other injuries, appropriate facilities can be searched via maps, with hospital choices based on GPS location. The app will use the injury description and timing to generate summary sheets; these will expedite intake at the selected facility.

These capabilities rely on a built-in knowledge base matching pediatric traumatic injury concerns to types of facilities and a database about individual local facility resources and capabilities. Existing Web tools and apps (e.g., PatientsLikeMe.com, Waze, Uber, etc.) illustrate that such apps are feasible and likely to be acceptable by users.

Anticipated Results

The tool will first be developed as a local demonstration project and then expanded to regional and then national capability. Results could include improved major injury outcomes, decreased false alarm rates for injury-related 911 services, reduced transfers and overall time to definitive medical care, and improved throughput across the system, all of which would increase patient and family satisfaction and potentially reduce overall cost to the system. Reasonable targets for initial demonstration are (a) a 5% decrease in urgent care and emergency room visits for minor injuries, without a concomitant increase in delayed presentation of major injuries, and (b) a 5% reduction in transfers to pediatric specialty centers.

Potential Partners and Funding Sources

After initial demonstration, National Institutes of Health/ Agency for Healthcare Research and Quality or PCORI may be appropriate sources to support further research and evaluation

(e.g., Agency for Healthcare Research and Quality’s Center for Delivery, Organization, and Markets; the Accelerating Change and Transformation in Organizations and Networks III initiative; and the Value research portfolio). Dissemination efforts could effectively leverage existing school and community athletics infrastructures. Smartphone and connectivity providers and companies sensitive to children and injury issues (e.g., sports teams, products, and apparel) could sponsor further development. Other possibilities for stakeholder partners include local government funding for emergency care and information services; creation of a nonprofit organization to run the program, supported by a small fee for the app; and possibly fee-based support from medical service providers (assuming imposition of controls to prevent conflicts of interest).

Barriers

Issues to be addressed will include the cost of initial app development, medical liability and insurance restrictions, testing sustainable support models via methods such as “crowdsourcing” to keep information about facilities up to date, and working with existing hospital alliances to improve care.

Future Steps

After a nationwide rollout, feasible additions to this program include real-time information on facility wait times, staffing, and resources; connection to first-available human advice; and telemedicine integration.

A PEDIATRIC TRAUMA TOOLKIT

Overview

Care provided in general hospitals is often more important to the ultimate outcome of injured children, because they are usually seen in these hospitals and not at pediatric TCs. For general hospitals, pediatric injuries are unusual conditions. Furthermore, because most children seen in general hospitals have minor injuries, the level of comfort and skill in the care of severely injured children is lacking. For general hospitals to optimize their preparation for pediatric injury care, we propose a virtual pediatric trauma toolkit. This toolkit could be used both as an “off the shelf” package of materials, as “plug and play” modules, and as a platform for local policies and procedures. Continuing medical education for providers could also be incorporated into the system. Nationally, and perhaps internationally, a comprehensive pediatric trauma toolkit does not exist.

Goals and Strategies

The taskforce established this goal: to develop an infrastructure and implementation plan for a sustainable pediatric trauma toolkit to augment providers’ pediatric trauma skill set and improve patient outcomes. The group then identified the following questions to develop as strategies for meeting the goal: (1) what can be done for people, including those in austere environments and systems before a pediatric trauma event happens; (2) how a toolkit can be used during an event; and (3) how the impact of the toolkit resources can be measured or assessed. The taskforce then was divided into subgroups, each devoted to one topic area. Areas of focus were as follows:

TABLE 1. General Requirements for a Pediatric Trauma Toolkit

1. Emergency medical services/hospitals without pediatric injury resources:
 - i. Checklist of equipment required and desired for pediatric injury care
 - ii. Prearrival checklists and just-in-time refresher information such as short video clips on how to perform pediatric procedures
 - iii. Pediatric trauma triage and transfer guidelines
 - iv. Resource maps for pediatric injury care
2. Moderate- and high-volume hospitals:
 - i. Policies and guidelines for various aspects of pediatric injury care
 - ii. Pediatric injury continuing education units and continuing medical education to maintain a competent workforce
 - iii. Transfer criteria
 - iv. Just-in-time refresher information such as short video clips on how to perform pediatric procedures
3. Trauma systems and general public:
 - i. Bystander first-aid training
 - ii. Injury prevention program development and legislative how-to's
 - iii. Tools for advocacy
 - iv. System process improvement tools (benchmarks and indicators)

1. prehospital medical care and health facilities with limited pediatric injury resources (combined because their clinical situations, equipment, and personnel training overlap);
2. moderate to well-equipped health care facilities, based on their pediatric injury resources;
3. trauma care systems and the general public, including policy makers; and
4. provider-specific continuing medical education.

Each subgroup was asked to determine the greatest needs in each area as seen through three frames of reference: organization and training needs before encountering an injured child, provider needs at the moment of care, and needs thereafter. Each group generated a list of needs that could be addressed by a toolkit in their user area and chose from that list the three needs they felt were the most important and feasible (Table 1). For a list of "must-have" features in the toolkit, see Table 2.

We envision that the development of the toolkit will require a group of content experts, to include adult and pediatric trauma surgeons, emergency medicine physicians, emergency room nurses, trauma nurses, critical care physicians and nurses, surgical specialists (neurosurgery and orthopedic surgery), prehospital providers (first responders to advanced transport teams), public policy experts, and representatives from payers and the health care industry.

TABLE 2. Essential Requirements for a Pediatric Trauma Toolkit

1. Available on handheld phones and from within an electronic medical record
2. Interactive, not a list of links
3. Pediatric calculators and widgets that are case based
4. Capability to track usage
5. Provides continuing education units and continuing medical education
6. Links to organizational member database to allow them to offer discounts, etc.
7. Be free or truly inexpensive
8. Pulsed downloads so that information can be downloaded in bulk then available when the provider doesn't have Internet access
9. Contain a search engine and overindexing of items to speed identification
10. Creation, frequent review, and revision by a multidisciplinary group

This group will collate existing materials, grade them using evidence (if it exists), and either choose the most appropriate item or consolidate existing resources into a combined document. They will identify gaps to be filled by the creation of new materials and propose studies to help fill the gaps. They will develop a marketing plan and will track usage of components of the kit to modify it as requested by users.

Creation of an electronic platform and videos for the toolkit, Web site hosting, maintenance of the product, and revisions of toolkit materials will require ongoing investment (estimated at \$500,000 for the first year). Ongoing sustainability, including updating and expanding offerings, is estimated to cost approximately \$250,000 annually.

Potential Partners and Funding Sources

Grant support, user fees, and/or membership dues from various partnering organizations that may offer toolkit use to their members could fund ongoing costs. Other potential avenues of financial support include grants from federal or state sources, foundations, or philanthropic sources. The finances required, although not trivial, pale in comparison to the potential benefits in medical and family expenses and in health outcomes of injured children.

A "DASHBOARD" TO MEASURE PEDIATRIC TRAUMA CARE

Overview

One team was charged with developing a specific plan to implement a national "report card" on the status of pediatric trauma systems. The charge included determining (1) the

TABLE 3. Queries for Pediatric Trauma System Development

1. Which states have trauma system legislation (funded or unfunded)?
2. Which states have a state Trauma Advisory Council, and is there pediatric representation?
3. Which states have a state-based trauma registry including pediatric patients?
4. For which states do destination protocols (triage plan) (nearest hospital vs. TC and who has control of this decision), transport guidelines, and transfer protocols between hospitals exist?
5. Is there a data repository for pediatric TCs by state?
6. Can we determine the number of pediatric TCs per pediatric population (<18 y old), based on distance or time to travel, and is this monitored at the state level?
7. Is there a way to determine the actual access or the percent of severely injured (Injury Severity Score >15) children 0–10 ye, who received definitive care at a Level I pediatric TC (vs. adult TC, vs. non-TC)
8. Is there a way to align the pediatric readiness data/information with readiness for pediatric trauma capability?
9. Which databases that exist in children's hospitals will be helpful for performance improvement and patient safety efforts in pediatric trauma?
10. Are there any financial data available that are instructive for pediatric trauma?
11. What are the resources for burn care in children by state?
12. What are the resources for inpatient or outpatient rehabilitation for pediatric trauma patients by state?
13. Is there state legislation for child fatality review that is instructive on nonaccidental trauma (child abuse)?
14. Which states have a disaster preparedness plan that describes surge capacity and includes children?
15. Which states undergo planning, simulation, and modeling with plans that include children?

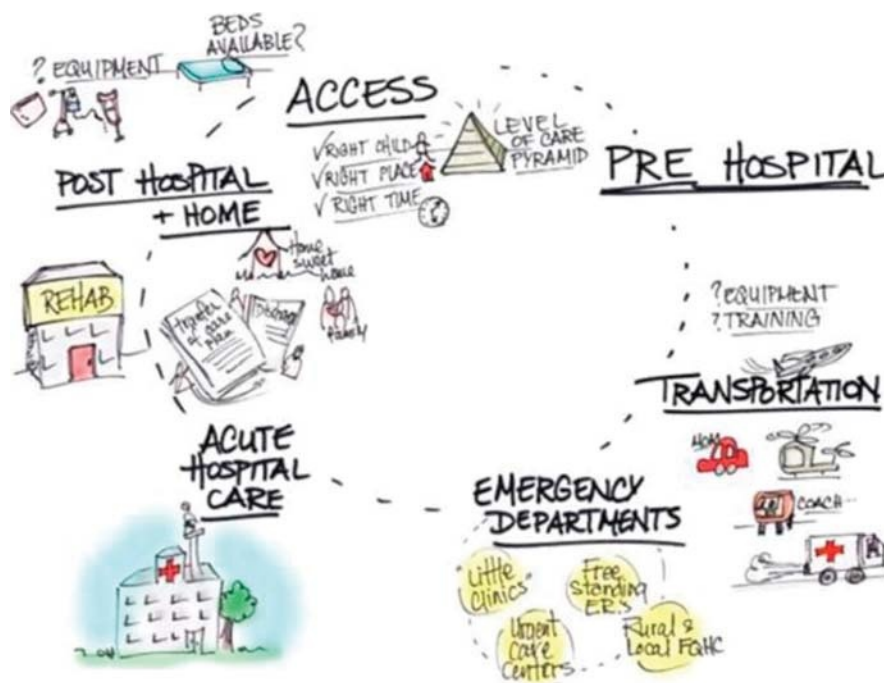


Figure 1. Pediatric trauma is a continuum of care.

elements to include in the report card; (2) the “units of analysis” (i.e., hospital, state, other); (3) how the data will be collected and from where; and (4) who will house the report card. The team was asked to develop a specific plan for ongoing operations and sustainability, budget and timeline, and potential and likely funding sources. After discussion, the team decided to promote the concept of a “dashboard” rather than a “report card,” to better promote comparisons among states to assess and facilitate progress in a nonjudgmental fashion.

Methodology

The team considered several topics and within those topics asked pertinent questions regarding performance (Table 3). Potential references were explored for information or opportunities for other reference sources. The team was divided into areas of expertise including: prevention/prehospital/emergency department, acute care phase/data, and trauma systems. See Appendix 1 for data sources used.

Information sources and resources included multiple national organizations, Web sites, and the peer-reviewed literature. Resources were grouped into the following categories: injury prevention, emergency medical services and prehospital care, the emergency department care system, acute care (operating room, inpatient, etc.), burn management, databases and outcomes, injury-specific management, nonaccidental trauma, rehabilitation, disaster preparedness, and trauma systems. We considered pediatric trauma as a continuum of care (Fig. 1).

Multiple lessons can be learned from the HRSA-funded EMSC program, which has funded State Partnership Grants, State Partnership Regionalization of Care grants, and the Pediatric Readiness Project. The EMSC partnership grants (given to states) assess prehospital and emergency pediatric care using performance measures (PMs). The State Partnership Regionalization of Care grants assist states in development of pediatric networks

of care and heightened awareness of pediatric access. The Pediatric Readiness Project determined whether hospital emergency departments could care for ill or injured children.

Anticipated Results

Potential PMs were developed according to the Donabedian model, a conceptual model that provides a framework for examining health services and evaluating quality of health care.⁴ According to the model, information about quality of care can be drawn from three categories: structure (the context in which care is delivered), process (the transactions between patients and providers throughout the delivery of health care), and outcomes (the effects of health care on the health status of patients and populations). In the context of pediatric trauma care, structure includes the trauma system, data, and prevention/public reporting; process includes pediatric readiness, imaging, nonaccidental trauma identification, burn care accessibility, and access to pediatric trauma care; and outcome includes destination decisions and reductions in child mortality and injury morbidity. Ultimately,

TABLE 4. Pediatric Trauma PMs

1. Emergency department: reduction of unnecessary computed tomography scans
2. Emergency department: improved recognition of child abuse
3. Emergency department: improved accessibility for burn care
4. Acute care: outcome measures by state publicly accessible data
5. State trauma system includes pediatric needs
6. State trauma data include children and are used for performance improvement
7. State emergency medical services data include children and are used for performance improvement
8. Disaster preparedness includes children in planning and implementation
9. Rehabilitation care includes pediatric needs
10. Prevention initiatives include children and are integrated within the state
11. Public reporting includes aspects of pediatric trauma care across the continuum

performance measurement must be reliable and meaningful and must be able to be assessed across states over time. Identification of significant pediatric injury requires education of the providers. The network of care spans all domains of the continuum and continues into community re-entry in some circumstances.

Performance Measures

The working group devised ideal performance measures pertinent to pediatric trauma patients that could be measured in a structured environment. These are listed in Table 4.

Potential Partners and Funding Sources

The overarching elements for a pediatric trauma system include research, outreach education, and evaluation (Fig. 2). Pertinent research must include peer review, publication, and strategic utilization by state. Outreach education must include professional development and education for all providers of pediatric trauma care. Inherent in any system is ongoing evaluation, to gauge progress toward achieving the milestones (in this case the PM) in each state rather than as a state-by-state comparison. Dissemination must be transparent and realistic in light of available resources and have face validity by being understandable to the lay public.

Implementation of this kind of program requires somewhere an institutional or organizational “home” for the program to be housed. Several extant national organizations could be appropriate as homes for this type of program (e.g., Pediatric Trauma Society, Committee on Trauma of the American College of Surgeons, the Childress Foundation, the EMSC program, or the National EMSC Data Analysis Resource Center).

Barriers

The current Trauma System Agenda for the Future was published in 2004 but fails to adequately address pediatric needs.⁵ There are states that still lack enabling trauma system legislation or established trauma systems, which is a significant

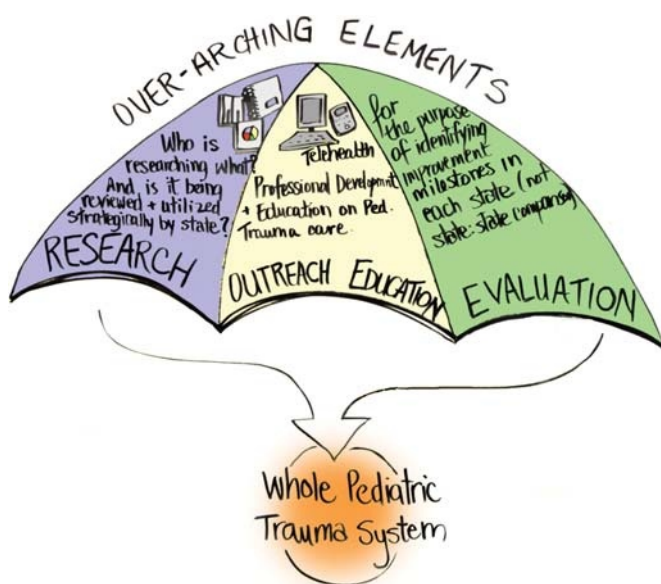


Figure 2. Overarching elements for an effective pediatric trauma system.

barrier to implementing a national dashboard. Some trauma systems are enabled but lack funding; furthermore, adults use TCs much more than children, making the needs of adult patients more pressing. Some states lack pediatric TCs or designated TCs with the expertise that children need. Many states lack developed networks of pediatric care that will satisfy triage requirements for children injured in remote areas. In addition, some emergency departments remain ill-equipped to care for children at all.⁶

Future Plans

A pilot project testing the proposed dashboard could be done, beginning in the seven states represented in the working group (District of Columbia, Kentucky, Ohio, Washington, Utah, Pennsylvania, and Wisconsin). Any pilot project will inform efforts needed to support this as a national effort.

A revision of the 2006 HRSA Model Trauma System Planning and Evaluation⁷ will be promoted through the National EMS Advisory Council to the Federal Interagency Committee on EMS. This document has been the basis for the American College of Surgeons Trauma System Consultation program in over 35 states, regions, and counties, but is in need of updating. The revision could more thoroughly incorporate and promote the needs of children within the global concept of trauma system development.

SUMMARY

The Childress Summit II sought to translate visionary statements into practical, meaningful initiatives to improve pediatric trauma care. A common theme was the goal of improving pediatric trauma care at all levels of the system. One team developed a strategy to better understand the needs of the CAHs, realizing that until the trauma community fully identifies the resources available at that level, it will be difficult to implement sustainable change. Barriers to change also need to be assessed and understood. Mobile applications for both parents and providers could be designed to give sophisticated data, quickly, to those who need it most. Such tools are a first step toward development of a sophisticated virtual toolkit. The availability of up-to-date, easily accessible information regarding the care of injured children is essential for practitioners who infrequently encounter these patients. Such a toolkit has the potential to bring pediatric trauma expertise to the bedside of all injured children. Finally, creation of a “dashboard” to allow benchmarking and process improvement will give states and territories consistent and thorough information to improve pediatric trauma care from the perspective of the trauma system.

APPENDIX

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DISCLOSURE

The authors declare no conflicts of interest.

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