



## POLICY STATEMENT

# Management of Pediatric Trauma

**AMERICAN ACADEMY OF PEDIATRICS**

Section on Orthopaedics, Committee on Pediatric Emergency Medicine, Section on Critical Care, Section on Surgery, Section on Transport Medicine, Committee on Pediatric Emergency Medicine

**PEDIATRIC ORTHOPAEDIC SOCIETY OF NORTH AMERICA**

Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of All Children

**ABSTRACT**

Injury is the number 1 killer of children in the United States. In 2004, injury accounted for 59.5% of all deaths in children younger than 18 years. The financial burden to society of children who survive childhood injury with disability continues to be enormous. The entire process of managing childhood injury is complex and varies by region. Only the comprehensive cooperation of a broadly diverse group of people will have a significant effect on improving the care and outcome of injured children.

This statement has been endorsed by the American Association of Critical-Care Nurses, American College of Emergency Physicians, American College of Surgeons, American Pediatric Surgical Association, National Association of Children's Hospitals and Related Institutions, National Association of State EMS Officials, and Society of Critical Care Medicine.

**INTRODUCTION**

Injury results in more deaths in children and adolescents than all other causes combined.<sup>1</sup> Deaths caused by injuries, intentional or unintentional, account for more years of potential life lost under the age of 18 years than do deaths attributable to sudden infant death syndrome, cancer, and infectious diseases combined. It is estimated that 1 in 4 children sustain an unintentional injury that requires medical care each year.<sup>2</sup> The cost of childhood injury in 1996 serves as an illustration for today.<sup>3</sup> In that year, unintentional childhood injuries resulted in an estimated \$14 billion in lifetime medical spending, \$1 billion in other resource costs, and \$66 billion in present and future work losses. Survivors of childhood trauma may suffer lifelong disability and require long-term skilled care. Improving outcomes for the injured child requires an approach that recognizes childhood injury as a significant public health problem. Efforts should be made to improve injury-prevention programs, emergency medical care, and trauma systems for pediatric patients. Additional topics related to the injured child that can complement and enhance our understanding of pediatric trauma management are addressed in other publications from the American Academy of Pediatrics.<sup>4-10</sup> This policy statement provides an overview of the desired components of trauma care systems in meeting the unique needs of injured children.

This statement has been endorsed by the American Association of Critical-Care Nurses, American College of Emergency Physicians, American College of Surgeons, American Pediatric Surgical Association, National Association of Children's Hospitals and Related Institutions, National Association of State EMS Officials, and Society of Critical Care Medicine.

**TRAUMA SYSTEMS**

The pediatric trauma system functions best as part of the inclusive emergency medical services (EMS), trauma, and disaster response system for the region or state. The inclusive trauma system is defined as 1 in which all hospitals participate in the care of injured patients. The regional adult trauma center or centers and the regional pediatric trauma center or centers are the central components of a trauma system. As was noted in a 2006 Institute of Medicine report, within any given EMS or trauma system, it is likely that not all hospitals will be completely equipped with appropriate pediatric resuscitation equipment or medications.<sup>11,12</sup> The Institute of Medicine report used the word "uneven" to describe the status of pediatric emergency and trauma care in the United States. There may also be significant variability in pediatric training and experience among physicians and nurses who staff hospital emergency

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**Key Words**

pediatric, trauma, injury, children

**Abbreviations**

EMS—emergency medical services

EMSC—Emergency Medical Services for Children (Add words as needed)

PICU—pediatric intensive care unit

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departments.<sup>13</sup> When the trauma system extends over a large geographic area, the outlying hospitals of the system must be able to undertake the stabilization and initial management of injured children who present to the hospital. Optimally, each trauma system will also define for itself the age range of the pediatric patient on the basis of specific hospital and physician resources available.

Even in regions of the country with well-developed trauma systems, most children are treated in facilities with no trauma center designation.<sup>14,15</sup> When a regional pediatric referral center is available within the trauma system, the smallest, most severely injured children often are eventually transported to that facility.<sup>14</sup> Trauma system administrators should recognize that all hospitals with emergency departments may be required to evaluate and resuscitate injured children.<sup>4,6,8</sup> Ideally, physician and nursing coordinators for pediatric emergency medicine should be identified in each facility, with pediatric-specific policies, procedures, and guidelines for care established.<sup>8,11</sup> An example of such guidelines are the Emergency Medical Services for Children (EMSC) performance measures that have been developed to assess a state's operational capacity to provide pediatric emergency care.<sup>16</sup> These guidelines can assist policy makers and care providers in prehospital-based and hospital-based settings in delivering optimal pediatric care.

Protocols for triage, treatment, and transfer of victims of pediatric trauma are an important part of any trauma system. Standard transfer protocols are available from many states and regional systems. The quality of care that is provided within the system should be continuously evaluated by the trauma system administration through performance-improvement processes. Outcomes for pediatric trauma patients should be compared with available benchmarks, and information should be shared with specific providers so that an optimal environment for quality improvement in pediatric trauma care is promoted.

### **PREHOSPITAL PEDIATRIC TRAUMA CARE**

Prehospital emergency care providers are often not as familiar with pediatric emergency management issues as they are with adult care<sup>17</sup> because of infrequent exposure of most EMS personnel to critically ill or injured children. This lack of experience is typically addressed by continuing education efforts for EMS personnel through established courses such as Pediatric Education for Prehospital Professionals,<sup>18</sup> Basic Trauma Life Support,<sup>19</sup> Prehospital Trauma Life Support,<sup>20</sup> or practical experience that is gained in children's hospitals. Pediatric readiness may also be facilitated by the presence of a pediatric emergency coordinator and advocate within each EMS system.<sup>17</sup> No matter how education is accomplished, mechanisms for knowledge and skill retention and continuous evaluation of performance are crucial for prehospital personnel. The method for maintaining skills may include continuous evaluation of performance. Direct feedback to the provider in the field is

required in any trauma system to improve outcomes for injured children. There is a relative lack of data supporting the best practices for pediatric resuscitation in the field, including fluid administration, cervical spine stabilization, and airway management of children. Comprehensive support for research in pediatric trauma needs to come from regional, state, and national organizations. Examples of such support include the federally funded EMSC program, the American Pediatric Surgical Association Outcomes and Clinical Trials Center, and the Pediatric Emergency Care Applied Research Network.<sup>21,22</sup>

### **TRAUMA CENTERS**

It has been shown that younger and more seriously injured children have better outcomes at a trauma center within a children's hospital or at a trauma center that integrates pediatric and adult trauma services.<sup>14,23–26</sup> The ability to provide a broad range of pediatric services, including the presence of physicians trained in pediatric emergency medicine, pediatric surgical specialists, pediatric anesthesiologists, and pediatric medical subspecialists, is important. Yet, the nationwide ability to provide around-the-clock trauma care may be in peril because of physician workforce shortages.<sup>27</sup> In particular, trauma care is increasingly unpopular because of lifestyle demands and inadequate reimbursement.<sup>28</sup>

Pediatric protocols for imaging and diagnostic testing<sup>29</sup> and a child-centered and family-centered environment for care<sup>30</sup> should be duplicated in trauma centers that are not part of children's hospitals whenever possible. Hospitals caring for pediatric trauma patients should have specific pain-management and sedation protocols and the ability to provide a full range of pediatric pain strategies for children, including systemic analgesics, regional and local pain control, anxiolysis, and distraction techniques. Pain management is critically important in managing trauma patients and transitioning them to rehabilitation.<sup>9</sup> Continuing education on trauma for hospital providers is important and is best accomplished by current verification in the American College of Surgeons Advanced Trauma Life Support course.<sup>31</sup>

Trauma centers may not have the resources to care for all of the injured children within their referral region at any given time. Thus, the most seriously injured children may need to be stabilized and transported to facilities with these resources. Hospitals that seek regional or state designation or verification through the American College of Surgeons verification process as a Pediatric Trauma Center are examples of facilities that have made an extraordinary effort to provide resources to care for injured children.

A well-equipped and staffed pediatric intensive care unit (PICU) is an essential component of a pediatric trauma center. Data demonstrate that the availability of PICU beds within a region may improve survival in pediatric trauma.<sup>26</sup> Pediatric critical care physicians, surgeons, and anesthesiologists who work together

and are trained in the care of the injured child are needed for optimal care of severely injured and unstable patients in the ICU. In addition to critically injured children, stable patients with the potential for deterioration may also require the specialized services of a PICU. Pediatric trauma care specialists, especially those with critical care training, are in short supply; thus, the nationwide delivery of pediatric trauma care is endangered.<sup>32</sup> PICUs offer a setting with the necessary monitoring devices, equipment, medications, and technology to support physiologic function and are staffed with professionals with the expertise to apply them to the pediatric patient. The presence of experienced PICU nursing and allied health care personnel support the environment necessary for frequent monitoring and assessment of injured children. Trauma care may continue on the inpatient unit once the child is stable and the probability of rapid deterioration is less likely.

Rehabilitation is another vital component of pediatric trauma care. Returning the child to full, age-appropriate function with the ability to reach his or her maximum adult potential is the ultimate goal after critical injury. Early rehabilitation is especially crucial for children who have sustained neurologic injuries. Physical, occupational, cognitive, speech, and play therapy, and psychological support are all essential elements of a comprehensive rehabilitation effort for the injured child and his or her family.

Trauma centers caring for children ideally will have active quality and performance improvement processes as an important component of the trauma service. In many trauma centers, quality improvement activities also include a focus on patient safety. Periodic review of trauma care by the providers of that care is the process that is most likely to improve patient outcomes in any hospital. Trauma care review is facilitated by a comprehensive trauma registry that has ties with national databases so that outcomes can be benchmarked for improved quality of care.

Pediatric trauma center personnel should be aware of reporting requirements for child abuse and neglect within their jurisdiction. Cooperation and collaboration with hospital-based child protection teams are essential for the management of cases of suspected abuse and neglect. The National Association of Children's Hospitals and Related Institutions has recently published guidelines for the establishment and management of hospital-based child protection teams.<sup>33</sup>

## INJURY PREVENTION

Injury prevention is the cornerstone of any discussion concerning pediatric trauma. Injury prevention initiatives work.<sup>34,35</sup> However, these initiatives are not promoted equally across the board, often because of limited resources. There are methods to identify and refine the approach to injury prevention initiatives that are specific for the region.<sup>36</sup> Every provider can contribute to injury prevention by documenting not only the nature of the injury but also the circum-

stances and antecedents as well. EMS systems, emergency departments, hospitals, and trauma centers should support and participate in data collection that promotes an understanding of the causes of injury (such as the use of external cause-of-injury codes or, if selected, participation in the National Electronic Injury Surveillance System [NEISS]) and should incorporate injury-prevention activities into staff and patient education and community-based intervention programs.

## RECOMMENDATIONS

- The unique needs of injured children need to be integrated specifically into trauma systems and emergency and disaster planning in every state and region.
- Pediatric surgical specialists and pediatric medical subspecialists should participate at all levels of planning for trauma, emergency, and disaster care.
- Every state should identify appropriate facilities with the resources to care for injured children and establish continuous monitoring processes for care delivered to injured children. Ensuring that the appropriate resources are available is especially important for the youngest and most severely injured children.
- All potential providers of pediatric emergency and trauma care should be familiar with their regional trauma system and be able to evaluate, stabilize, and transfer acutely injured children.
- Although qualified pediatric critical care transport teams should be used when available in the interfacility transport of critically injured children, evaluation and management should begin with the care providers at the first point of entry into the trauma system.
- Every pediatric and emergency care-related health professional credentialing and certification body should define pediatric emergency and trauma care competencies and require practitioners to receive the appropriate level of initial and continuing education to achieve and maintain those competencies.
- Efforts to define and maintain pediatric care competencies should target both out-of-hospital and hospital-based care providers.
- Evidence-based protocols for management of the injured child should be developed for every aspect of care, from prehospital to postdischarge.
- Research, including data collection for best practices in isolated trauma and mass-casualty events, should be supported.
- Pediatric injury management should include an integrated public health approach, from prevention through prehospital care, to emergency and acute hospital care, to rehabilitation and long-term follow-up.
- National organizations with a special interest in pediatric trauma should collaborate to advocate for a

higher and more consistent quality of care within the nation.

- National organizations with a special interest in pediatric trauma should collaborate to advocate for injury-prevention research and application of known prevention strategies into practice.
- State and federal financial support for trauma system development and maintenance must be provided.
- Steps should be taken to increase the number of trainees in specialties that care for injured children to address key subspecialty service shortages in pediatric trauma care. Strategies should include increased funding for graduate medical education and appropriate reimbursement for trauma specialists.

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