

# Principles of Disaster Planning for the Pediatric Population

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**Keywords:** disaster; pediatric population; pediatrics; planning

## Abbreviations:

DMAT = Disaster Medical Assistance Team  
EMSC = Emergency Medical Services for Children  
TJC = The Joint Commission

Received: 20 February 2007

Accepted: 29 May 2007

Web publication: 27 December 2007

## Abstract

Unique physiological, developmental, and psychological attributes of children make them one of the more vulnerable populations during mass-casualty incidents. Because of their distinctive vulnerabilities, it is crucial that pediatric needs are incorporated into every stage of disaster planning. Individuals, families, and communities can help mitigate the effects of disasters on pediatric populations through ongoing awareness and preventive practices. Mitigation efforts also can be achieved through education and training of the healthcare workforce. Preparedness activities include gaining Emergency Medical Services for Children Pediatric Facility Recognition, conducting pediatric disaster drills, improving pediatric surge capacity, and ensuring that the needs of children are incorporated into all levels of disaster plans. Pediatric response can be improved in a number of ways, including: (1) enhanced pediatric disaster expertise; (2) altered decontamination protocols that reflect pediatric needs; and (3) minimized parent-child separation. Recovery efforts at the pediatric level include promoting specific mental health therapies for children and incorporating children into disaster relief and recovery efforts. Improving pediatric emergency care needs should be at the forefront of every disaster planner's agenda.

Allen GM, Parrillo SJ, Will J, Mohr JA: Principles of disaster planning for the pediatric population. *Prehospital Disast Med* 22(6):537–540.

## Introduction

Disaster planning that thoroughly incorporates the specific vulnerabilities of the pediatric population serves to increase a healthcare facility's success in treating children involved in a mass-casualty incident. Disaster planners have largely failed to meet the needs of this population in this post-September 11 environment. Planners tend to overlook pediatric needs because childhood is not always viewed as a separate and distinct stage of growth. Moreover, there exists an expectation during emergencies that children can and should receive the same care as adults.<sup>1</sup> Disaster plans fail to address pediatric considerations, and the few that do often assume children can be treated as "small adults".<sup>2</sup> Their unique physiological, developmental, and psychological needs must be reflected in each and every phase of disaster planning.

## Physiological Vulnerabilities of the Pediatric Population

Fundamentally, children are different than adults and cannot be treated as merely "small adults".<sup>2</sup> Their distinctive attributes contribute to their identification as one of the more vulnerable populations in disaster situations. In fact, children exhibit significantly higher mortality rates in disasters when compared to the adult population. This probability increases further for children under five.<sup>3</sup> With regards to physiological makeup, their organs are proportionately larger, closer together, and not as well-protected as are adult organs. Their small size increases their chances of sustaining serious head and multi-system organ injuries from blunt trauma.<sup>4</sup> The fact that children breathe faster and have more rapid heart rates increases their susceptibility to airborne chemical and biological agents.<sup>2</sup> Children also metabolize drugs differently than

adults, thereby requiring varying dosages of drugs, antidotes, and specialized equipment for medication administration.<sup>1,2</sup>

### Developmental and Psychological Vulnerabilities of the Pediatric Population

Developmentally, children lack the self-preservation and cognitive skills that enable them to know how to react.<sup>1,5</sup> The coping skills of children are less developed than are those of adults. Their mental health suffers not only from direct exposure to traumatic events but indirect exposure, as well.<sup>6</sup> Psychological stress impedes their growth and development patterns. The chaos associated with disaster events may induce a crippling sense of fear or anxiety in children (e.g., post-traumatic stress disorder) and is magnified in children when their parents suffer from similar psychological afflictions. Disasters increase the possibility of parent-child separation, either temporarily or permanently due to death of the parent.<sup>3</sup> Despite their inherent psychological differences, children exhibit an incredible potential for resiliency in the aftermath of a disaster.<sup>1</sup>

### Incorporating Pediatric Needs in Disaster Planning

Because of their distinctive vulnerabilities, it is crucial that pediatric needs are incorporated into every stage of the disaster planning process. The goal of mitigation, the first phase of disaster planning, is to utilize pre-event hazard analysis as a means of reducing a community's vulnerability to illness, injury, death, and loss of property. Individuals, families, and communities can mitigate the effects of disasters on the pediatric population through ongoing awareness and preventive practices. Although it is impossible to protect children from all of the physical and emotional effects of disasters, parents can prepare their child by increasing their resiliency and ability to handle stress. Children who develop coping strategies for dealing with stress fare better when faced with severe, unexpected stressors imposed by natural or human-made hazards.<sup>7</sup>

Mitigation efforts also include educating and training the healthcare workforce. Formal training helps professionals recognize and manage life-threatening events in the pediatric population and educates them on childhood growth, development, pediatric triage, and how to manage children with special needs. The American Academy of Pediatrics is one of several organizations that offers training through courses such as Pediatric Education for Prehospital Professionals (PEPP) and the Neonatal Resuscitation Program (NRP). Nurses can participate in an Emergency Nursing Pediatric Course (ENPC) offered by the Emergency Nurses Association. Hospitals should encourage their staff to enroll in such courses; certified staff will respond more effectively when presented with pediatric mass-casualty victims.<sup>5</sup>

### Focusing Preparedness Efforts on the Pediatric Population

Achieving preparedness requires healthcare facilities to implement measures focusing exclusively on this population. Gaining Emergency Medical Services for Children (EMSC) Pediatric Facility Recognition is an important first step toward preparedness. Conducting pediatric-inten-

sive care drills, improving pediatric surge capacity, and ensuring that the needs of children are incorporated into all levels of disaster plans can augment efforts even further. Healthcare facilities can look toward the national EMSC program for guidance on improving pediatric emergency care. The only federal program with an objective of this nature is EMSC, which provides federal funding to all 50 states and US territories for development of their own EMSC program based on national standards.<sup>8</sup>

Voluntary participation in the EMSC Pediatric Facility Recognition process allows healthcare facilities to attain recognition and classification at one of three levels. Smaller hospitals with resources for initial pediatric treatment can gain "Standby Emergency Department Approved for Pediatrics" (SEDAP) status. Facilities with 24-hour physician coverage, but without pediatric intensive care units can be designated as an "Emergency Department Approved for Pediatrics" (EDAP). The third and highest level of recognition, "Pediatric Critical Care Center" (PCCC) is granted to a healthcare facility that has a pediatric intensive care unit and other pediatric specialty resources. Establishing recognition as a pediatric care facility is a critical first step in planning for the effective care of pediatric victims involved in a mass-casualty incident.<sup>8</sup> Emergency Medical Services for Children Performance Measure No. 66 mandates that by 2011, states must implement a standardized system for identification of hospitals capable of providing or managing pediatric emergency care.<sup>9</sup> Illinois has completed this Performance Measure and has developed a Website listing those facilities that have achieved EMSC status.<sup>10</sup>

Disaster drills, a focal point of disaster preparedness efforts, teach hospital staff to efficiently respond to mass-casualty incidents. The Joint Commission's (TJC) (formerly the Joint Commission on Accreditation of Healthcare Organizations) 2006 Hospital Accreditation standards require hospitals to perform two drills per year, at least one of which should be a community-wide drill assessing the inter-operability of hospital and community organizations. Missing from TJC standards is a clear pediatric component; in fact, most disaster drills overlook any degree of pediatric involvement. This proves troublesome in that during mass-casualty incidents, most children receive treatment at general hospitals, not children's hospitals.<sup>11</sup>

Healthcare facilities must take the initiative for pediatric preparedness by conducting their own drills. Drills should include children with special healthcare needs and those with mental health emergencies. Disaster drills also should incorporate pediatric victims in various settings, including schools, day care facilities, and school buses to adequately test the federal, state, and local capacities to provide care for pediatric victims.<sup>2</sup> Hospitals can improve their pediatric response vastly by including a pediatric mass-casualty incident in their drills at least once every two years.<sup>11</sup> Drills also should feature a pediatric decontamination component to help staff identify the differences in practice with small children and infants and highlight any insufficiencies in the existing protocol.

Hospitals in the US lack the capacity to handle the increased volume of patients associated with mass-casualty

incidents, especially when those patients consist of infants or small children.<sup>11</sup> Surge capacity for pediatric patients is reduced further by the limited number of pediatric facilities in this country. According to the National Association of Children's Hospitals and Related Institutions (NACHRI), the US has approximately 250 to 275 pediatric hospitals, representing 5% of 5,000 US hospitals. Of the children's hospitals, 36% are specialty-based. Children comprise 20% of the population, yet only 5% of US hospitals have the resources to care for them adequately.<sup>1</sup> Regional disaster plans should reflect strategies for increasing pediatric surge capacity through the conversion of outpatient procedure beds into inpatient beds, the discharge of patients in a timely manner, and the use of hallways or alternate areas such as cafeterias for patient treatment.<sup>5</sup> Disaster plans also must focus on pediatric treatment outside of the hospital, through the establishment of a pediatric triage site and mechanisms for mobilization of healthcare professionals with pediatric knowledge.<sup>12</sup>

The majority of the children's hospitals and the pediatric departments of general hospitals have done little in regard to disaster planning for pediatrics.<sup>2</sup> All hospitals must be prepared to treat children in the aftermath of a mass-casualty incident. Hospitals may find themselves in the position of providing care to children if they are closest in proximity to the incident, or if other pediatric facilities in the area have expended their resources. All hospital and prehospital plans at the federal, state, and local level must be reviewed to ensure specific inclusion of the medical care of pediatric patients.<sup>2</sup>

Disaster planning committees should include hospital-based pediatricians, nurses, and child life specialists trained in responding to children's unique physical, psychological, and emotional needs.<sup>5</sup> Disaster plans also must be supplied with shelter, transfer, and evacuation protocols.<sup>11</sup> Shelters need specific pediatric resources, such as formula, diapers, and cribs, in advance of a disaster.<sup>9</sup> With regards to transfer, there exists a need for protocols, as only 40% of emergency department hospitals have specific procedures regarding pediatric transfers.<sup>7</sup> Disaster plans should include evacuation protocols for schools, day care agencies, and the like, as more than one-fifth of the US population is in school on any given weekday.<sup>2</sup>

### Improving Healthcare Response

Enhancing pediatric disaster expertise, altering decontamination protocols to reflect pediatric needs, and minimizing parent-child separation can enhance pediatric response significantly. Local and federal response agencies should focus on enhancing pediatric disaster expertise. Responders who lack experience in dealing with pediatric casualties will not perform adequately in a mass-casualty incident involving children. All emergency care providers should undergo training and disaster education related to the special needs of the pediatric population.<sup>11</sup>

Although prehospital and emergency department personnel are the first responders in the event of a disaster, they are not the only individuals who respond. When local and state resources are overwhelmed, the federal govern-

ment will augment response through deployment of Disaster Medical Assistance Teams (DMATs). Disaster Medical Assistance Teams consist of professional and para-professional medical personnel, including physicians, nurses, and emergency medical technicians. As of 2004, there were 43 DMATs nationwide, only two of which specialized in pediatrics. Studies indicate that DMAT leaders are not adequately skilled in dealing with the pediatric population, despite the pediatric component present in their training. Increasing the number of pediatricians and pediatric emergency medicine physicians on these teams should improve the overall level of pediatric expertise.<sup>11</sup>

The lack of an established protocol for decontaminating pediatric casualties further complicates response. Children require extra care and consideration during decontamination, that disaster plans must reflect.<sup>1</sup> An ideal child decontamination unit would feature a high-volume, low-pressure system with warm water and would accommodate families for group showering. Pediatric victims need immediate access to warming equipment and supplies after showering, including blankets, overhead heat lamps, isolettes/radiant warmers, and appropriately sized gowns.<sup>5</sup> Decontamination presents challenges for both personnel and children. The procedure often frightens children because of the identity-concealing personal protective equipment donned by the response personnel and the increased chance of separation.<sup>12</sup> The cumbersome personal protective equipment makes managing a child quite challenging,<sup>1</sup> and, therefore, effectively decontaminating children may require increased manpower. Clearly, establishing a standard decontamination protocol for pediatric patients would allow for a more uniform and effective response during a mass-casualty incident.

Disaster plans usually lack pediatric decontamination protocols and fail to outline clear protocols for planning in the event of parent-child separation. Mass-casualty incidents such as Hurricane Katrina highlighted the need for strategies that minimize parent-child separation and improve methods for reuniting separated children with their families. Planners should not automatically assume that children will be in the custody of their parents when a disaster occurs. If children must be separated, care must be taken to retrieve complete identification information from the parents.<sup>11</sup> The National Advisory Committee on Children and Terrorism suggests designating a temporary responsible adult to oversee the child until the government or family assumes custody.<sup>2</sup> Use of identification bracelets, nametags, digital photos, or even electronic tracking devices can ease identification efforts. Disaster plans should take into consideration that a child may have a non-traditional family structure and that non-custodial parents or other relatives may be concerned about the location of a child after a disaster.<sup>11</sup>

### Recovery Efforts

Recovery, the fourth and final stage of disaster planning, involves the rebuilding of communities by individuals, families, businesses, and governments. Rebuilding enables individuals to return to normal life and function on their own.<sup>5</sup> Recovery efforts at the pediatric level include promoting

specific mental health therapies for children and incorporating children into disaster relief and recovery efforts. Healthcare providers, children, and families need access to mental health and recovery resources following traumatic events. Parents should encourage their children to discuss their feelings and worries and offer verbal assurance that the events are not the child's fault. Families should make an effort to return to their normal routine as quickly as possible, and parents should take time to deal with their own feelings.<sup>5</sup> Children should be viewed as beneficiaries with basic rights to survival, protection, and development and as crucial sources of information regarding their communities, neighborhoods, and family assets. Children who are actively involved can positively impact their community in

the short- and long-term by helping mitigate the loss of life and by supporting recovery efforts.<sup>13</sup>

### Conclusions

The majority of hospitals, including pediatric facilities, fail to address the specific vulnerabilities of children in their disaster plans. Every pediatric-intensive or general healthcare facility must thoroughly prepare and train for the influx of pediatric victims during a mass-casualty incident. Efforts must be made to integrate the needs of the pediatric population into every stage of disaster planning, namely mitigation, preparedness, response, and recovery. Disaster planning for the pediatric population should be addressed not only at the local level, but also at the regional and state levels, as well. Improving pediatric emergency care needs must be at the forefront of every disaster planner's agenda.

### References

1. Ginter PM, Wingate MS, Rucks AC, Vasconez RD, McCormick LC, Baldwin S, Fargason CA: Creating a regional pediatric medical disaster preparedness network: Imperatives and issues. *Matern Child Health J* 2006;10(4):391-396.
2. National Advisory Committee on Children and Terrorism: Recommendations to the Secretary. Available at <http://www.bt.cdc.gov/children/PDF/working/Recommend.pdf>. Accessed 12 October 2006.
3. Becker BM: Children and Disaster. In: Ciottone G (ed), *Disaster Medicine*. Philadelphia: Elsevier Mosby, 2006, pp 51-58.
4. Weiner DL, Manzi SF, Waltzman ML, Morin M: The National Disaster Medical System Response: A pediatric perspective. *Pediatrics* 2006;117(5):s405-s411.
5. Illinois Emergency Medical Services for Children: Pediatric Disaster Preparedness Guidelines. Available at <http://www.luh.org/depts/emsc/peddisasterguide.pdf>. Accessed 12 October 2006.
6. Madrid P, Grant R, Reilly MJ, Redlener NB: Short-term impact of a major disaster on children's mental health: Building resiliency in the aftermath of Hurricane Katrina. *Pediatrics* 2006;117(5):s448-s453.
7. Rumm PD: Public health's role in terrorism preparedness and response for children. Available at <http://www.bt.cdc.gov/children/word/working/federal.doc>. Accessed 12 October 2006.
8. Emergency Management Watch: Emergency preparation for special populations, Part 1: Pediatrics: Vulnerable patients need extra care. *Environment of Care News* 2005;8(12):8-10.
9. Emergency Medical Services for Children (EMSC) Program Implementation Manual for EMSC State Partnership Performance Measures: Appendix: Development of Performance Measures for the EMSC Program Detail Sheet for Performance Measure #66. Available at <http://bolivia.hrsa.gov/emsc/PerformanceMeasures/PerformanceMeasuresComplete.htm#appendix>. Accessed 07 February 2007.
10. Illinois Department of Public Health: EMS for Children. Available at <http://www.idph.state.il.us/about/hospital/emshome.htm>. Accessed 07 February 2007.
11. (US) Institute of Medicine: Improving Emergency Preparedness and Response for Children Involved in Disasters. In: *Emergency Care for Children: Growing Pains (Future of Emergency Care)*. Washington, DC: National Academies Press, 2007.
12. Committee on Environmental Health and Committee on Infectious Disease: Policy statement: Chemical-biological terrorism and its impact on children. *Pediatrics* 2006;118(3):1267-1278.
13. Penrose A, Takaki M: Children's rights in emergencies and disasters. *Lancet* 2006;(367)9511:698-699.