



# Pediatric Emergency Preparedness for Natural Disasters, Terrorism and Public Health Emergencies

National Consensus Conference



National Center for  
Disaster Preparedness

Mailman School of Public Health  
Columbia University

**2009 Update**



# **Pediatric Emergency Preparedness for Natural Disasters, Terrorism, and Public Health Emergencies- a National Consensus Conference**

## **2009 Update**

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*We wish to thank the Children's Health Fund  
for their generous support of this meeting.*



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## OVERVIEW OF THE 2009 MEETING

This is the third consensus document in an ongoing process to convene experts from the multiple disciplines that are involved in the planning for children affected by disasters.

In 2003 and subsequently in 2007, the National Center for Disaster Preparedness published the consensus findings of two national meetings of expert stakeholders in pediatric medicine, emergency preparedness, public health, prehospital care, and the emergency services, led by the efforts of Drs. Irwin Redlener and David Markenson, principal investigators.

Through a collaborative decision-making process, the meeting attendees developed a list of prioritized action items and recommendations on issues related to pediatric preparedness, response, and recovery to major disasters. The reports, published and widely distributed, have been broadly referred to by planners and officials who are striving to ensure that the needs of children will be met when a catastrophe occurs.

In 2009, with the support of the Children's Health Fund, the National Center for Disaster Preparedness convened a one-day panel of national leaders in pediatric disaster preparedness. The purpose was to review some of the key findings of the 2007 Pediatric Preparedness for Disasters and Terrorism report and make updated recommendations to the content where indicated, in an effort to reflect the increasing body of both evidence and best practice information on the subject.

The 2009 recommendations are presented in this report. For topics and content from the 2007 report that were not revisited, the previous recommendations are included, with notation.

By definition, consensus development (with respect to medical treatment recommendations) is needed in the absence of definitive research and evidence to support preferred interventions. Effective consensus building is dependent on assembling appropriate subject matter experts, monitoring on-going, relevant research and the willingness to allow opinions to coalesce as what amounts to an informed, collective opinion. At the same time, it is recognized that consensus opinions are necessarily imperfect. New research can rapidly modify a consensus recommendation. In addition, experts, who are presumed to have reasonably representative understandings of major issues, current research and appropriate experience in their fields, are selected to participate in the process. who are presumed to have reasonably representative understandings of key issues, current research and appropriate experience in their fields.

In the consensus conference process we push participants to come to a collective recommendation in spite of insufficient definitive information; that is, in fact, the point. The exercise is based on imagining oneself in a situation where a major event is in progress in which you are called upon as a consultant. An answer is required, beyond "evidence is inconclusive or absent" and arrive at a course of action for a patient who cannot wait for the literature. The process is not perfect, but under disaster conditions, it may be our best option.

Finally, for areas not covered in the 2009 meeting, the editors reviewed, and occasionally commented on, recommendations from the previous edition; in such cases, we have clearly identified new commentary. All sections of the 2007 edition of the consensus conference were, therefore, either reviewed by the 2009 panel or by the editors.

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## INTRODUCTION and BACKGROUND

A disaster can be described in many ways. For our series of meetings it is defined as a significant event that causes injury or loss of life, affects a large population or area, destroys property and causes local officials to reach outside of their traditional boundaries to seek assistance. Historically, much of the planning for disaster preparedness, response, and recovery has primarily considered the needs of adults. It is clear from disasters, such as Hurricane Katrina, that the vulnerabilities of children can put them at a disproportionate risk during a disaster; failing to address the needs of children can topple even the best laid preparedness plans. As a nation we should strive towards a common goal of providing equity in preparedness to all of the members of our community.

### Special Considerations in Emergency Preparedness for Children

Children have unique vulnerabilities to emergencies that must be accounted for in the planning for disasters, terrorism and public health emergencies. Examples of these differences include a range of biological, psychological, and sociological factors, such as:

- Children are more vulnerable than adults to chemical agents that are absorbed through the skin or inhaled.
- Children have special susceptibilities to dehydration and shock from biological agents.
- Children cannot be easily or rapidly decontaminated in adult decontamination units.
- Children require different dosages or different antibiotics and antidotes to many agents.
- Children are more susceptible than adults to the effects of radiation exposure and require different medical countermeasures.
- Children have unique psychological needs and vulnerabilities, and special management plans are needed in the event of mass casualties and evacuation.
- Emergency responders, medical professionals, and children's health care institutions may require special expertise and training to ensure optimal care of those exposed to chemical, biological, or nuclear agents as well as severe psychological stressors.
- Children's developmental ability and cognitive levels may impede their ability to escape danger.

EMS, medical, and hospital staff may not have specialized pediatric training, or access to specialized equipment or facilities. Traditional thinking has focused on military personnel as the potential victims of biological, chemical, or radiological attacks; therefore, the treatments, antidotes, and research needed to help such victims have primarily focused on the needs of adults. Unfortunately, today, the entire population, including communities, families, and children, are at risk of experiencing a terrorist event that involves biological, chemical, or radiological weapons. As a result, current efforts must include research, planning, and preparation for the special and different needs of pediatric victims of terrorist events.

Emergency planners and emergency responders must shift their thinking to adopt the "one community" model of preparedness. This includes planning for the needs of children, those with disabilities, and those in special circumstances alongside the planning for adults. Very specific forethought is required because preparedness for children cannot be accomplished by simply scaling down or modifying existing practices.

Planning for and responding to disasters has traditionally been the responsibility of government agencies. The Department of Homeland Security and its Federal Emergency Management Agency (FEMA) are involved in declared national emergencies, as are a number of other federal agencies such as the Department of Transportation, Department of Defense, Department of Housing and Urban Development, and Department of Health and Human Services. Additionally, state and local emergency management agencies have area-wide response plans, and must be prepared to serve as the initial responders to a disaster of any size and type. The ideal response to and recovery from a disaster involves neighborhoods and families, although this involvement falls far below what would be ideal. A wide range of volunteer organizations also have vital roles in disaster response. Academic schools of medicine and public health have provided the foundation for this planning based on their research and collections of expertise. In the future, these institutions need to have a more active role in disaster and terrorism preparedness and planning. A successful response to a disaster requires the interaction of personnel and resources from multiple agencies in an organized and coordinated manner according to a well-formulated plan.

Policy statements of national professional organizations, while identifying issues and providing suggestions, cannot ensure an organized response to pediatric disasters alone. They can be more useful if explicitly endorsed by local public health and safety authorities and if fully integrated into local disaster preparedness initiatives; and because of the lack of data, these policies are often based on a “best advice” approach. Moreover, without a consistent approach to preparedness for the effects of disasters, terrorist events and public health emergencies on children from state to state, it will be difficult, if not impossible, for national pediatric professional organizations to educate their members about their roles and responsibilities during disasters affecting children. A consistent approach is essential to empower federal agencies, non-governmental organizations, state offices of emergency management and public health, local public health and safety authorities, local chapters of national pediatric professional organizations, and the members of such organizations to do the following: 1) conceptualize and integrate the roles and responsibilities of pediatric health professionals during disaster and terrorist events, 2) build partnerships that will allow a rapid and integrated response to a disaster, 3) realize the planning that will be necessary to ensure a timely and appropriate response by the involved parties, and 4) collaborate effectively in time of need.

Integrating pediatric needs into federal, state, and regional/local disaster planning is critical. A major step forward in this aspect was the recently released Model Pediatric State Disaster Plan. While this was an important step to correct this deficiency, we must continue evaluate data on the needs of children in disasters, establish consensus in those areas in which data do not exist, and develop and implement a research agenda to fill the identified voids.

# RECOMMENDATIONS

## 2009 Highlights

The following icons will be used throughout this report to indicate 2009 updates:



**for updated recommendations on chemical agents**



**for updated recommendations on biological agents**




**for updated general recommendations on public health preparedness**

## EMERGENCY AND PREHOSPITAL CARE

The cornerstone of emergency preparedness and terrorism response rests with the first responders. They provide not only the initial care but also the initial assessment, which is critical to ensure that all patients receive the care needed, while appropriately allocating scarce resources during disaster and terrorist events. As a result, any emergency response planning must begin with well-trained, well-equipped first responders who must be prepared to perform triage and to provide needed care.

The following recommendations address the minimal elements for proper triage and prehospital care of children by first responders.

### Triage

	<b>Updated Comments on a Pediatric-Specific Triage System for Use During a Disaster</b>
Rather than endorsing one particular triage system, the panel emphasized the need to have a pediatric triage capability in place in all areas of the nation.	
The focus of the capability should be on the interoperability of responders and medical facilities across multiple jurisdictions— there should be no question of what condition the patient is in once the triage category is identified.	
Any triage system that is in place must take into account the specific physiologic vulnerabilities of children in disaster.	

### 2007 Recommendations:

- Continue to develop, improve, and implement triage systems that are objective and child-specific to advance the efficiency and accuracy of triage.
- Ensure integration and consistency of use of pediatric triage processes among local, state, and federal responders, including Disaster Medical Assistance Teams (DMATs).
- Develop and use pediatric-specific triage systems that address primary, secondary, and tertiary triage. These will address all aspects of disaster triage, including psychological triage, triage for Chemical, Biological, Radiological, Nuclear and Explosive (CBRNE) events, and triage for children with special health care needs.
- Include evaluation of triage processes and performance in quality assessment procedures (performed after the event) at local and state levels, as well as in future research initiatives.

## Prehospital Care

### 2007 Recommendations:

- Equip emergency medical services (EMS) personnel and response vehicles with pediatric-capable equipment and medications if that treatment capacity exists for adults. This includes supplies for decontamination and assessment/treatment for biological, chemical, and radiological terrorism.
- Establish model guidelines and best practices for communication, documentation, community involvement, equipment, medical oversight and strong Incident Command Systems, children with special health care needs, and schools (both public and private).
- Ensure that EMS systems have disaster and terrorism response protocols for both basic life support and advanced life support that address the unique needs of children.

*[Editor's note: Ongoing recent efforts have been taking place to standardize the need for adequate pediatric equipment for EMS services, and to make this a requirement for receiving ongoing financial support from the EMS for Children program and other federal funding sources. Additionally, this issue has been a priority agenda item for the National Commission on Children and Disaster. The most recent iteration of this consensus process was completed in 2009. Please see the following: Policy Statement—Equipment for Ambulances. Pediatrics. Vol. 124 No. 1 July 2009, pp. e166-e171. It is also important to acknowledge that the developments of standardized performance measures for pediatric prehospital care are as important for everyday care of the child patient as they are to the delivery of services during a disaster.]*

## HOSPITAL CARE



### **Emphasizing the important role of regionalization of pediatric emergency and disaster care**

The panel discussed and highlighted the importance of continuing to develop and utilize strong networks of pediatric expertise and specialty care for emergency, trauma, disaster medicine and other specialties. Examples include the establishment of pediatric disaster medicine centers of excellence that can collaborate with other providers in the region before, during, and after a disaster occurs, thereby reducing the reliance on outside regions and the federal government during a crisis.

An additional recommendation is the establishment and support of pediatric care coordinators in a region for EMS and disaster care, ideally connected to a regional center of excellence.

An essential part of this process is the development of connections between the public and private sectors engaged in the delivery of care in a region.

Medical preparedness depends on a combination of public health direction and general hospital preparedness. Hospital preparedness encompasses a wide range of issues that include preparedness of both the physical facility and the staff. The hospital also serves as a regional resource to other health care facilities and as the medical oversight and training resource for first responders. Beyond this, the need for specialty resource centers and their designation and role in emergency preparedness must also be recognized. Specialty resource centers are defined as facilities with unique capabilities beyond those expected of any general hospital for specific problems and that have received designation in this area of expertise from an appropriate accrediting organization. Examples of specialty resource centers include Trauma Centers, Burn Centers, Hyperbaric Centers, and Pediatric Critical Care Centers. Likewise, hospitals are a fundamental resource of trained staff that may be needed in times of emergency or by other facilities, or both.

All of these elements are important considerations with regard to the needs of children. During a natural disaster, terrorist event, or public health emergency children will undoubtedly arrive at general hospitals. Therefore, all hospitals must be prepared for an unusually greater number of pediatric victims. Besides their general importance, specialty centers must also be prepared for increased pediatric needs. Staff and physician volunteer programs, which are essential to ensuring adequate numbers of providers, must also recognize the need for more pediatric-trained providers; currently, the availability of providers who have pediatric training is limited.

The following recommendations address hospital preparedness, specialty centers, physician volunteers, and the role of the children's hospital.

## Hospital Preparedness

### 2007 Recommendations:

- Ensure preparedness in all hospitals, with children's hospitals playing a crucial role in educating the community, training health care providers, and directing the care of children in general hospitals when the numbers of children or logistics prevent transport to a children's hospital.
- In the absence of a recommendation from hospital regulatory authorities, at a minimum keep a 72-hour supply of all necessary pediatric equipment and pharmaceuticals on hand for the average daily number of pediatric patients plus an additional 100 patients.
- Include a detailed pediatric component in Web-based hospital resource availability networks.
- The National Bioterrorism Hospital Preparedness Program and any other federal funding to states must include pediatric specific objective and measurable objectives.
- Engage in a pediatric-specific disaster risk assessment with the community, including school districts, the Office of Emergency Services, EMS, the police department, the fire department, private practitioners, child welfare organizations, child care establishments, public health organizations, and mental health facilities.
- Develop informational resources and training for pediatric-specific responses to biological, chemical, and radiological terrorism.
- Ensure that all hospital emergency operations plans and preparedness policies include pediatric care and treatment guidelines and account for the unique aspects and needs of children.
- Ensure that all agents and equipment that are stocked for natural disasters, terrorism and public health emergencies are either specifically designed and both specifically designed and approved for pediatric use or can be appropriately substituted for pediatric use.
- Include pediatric patients in all hospital drills and exercises, with at least one annually that causes hospitals to receive predominantly pediatric patients and significantly out of proportion to the normal percentage of pediatric patients they handle.

## Specialty Resource Centers, Metropolitan Medical Response Systems, Community Response Teams, and Healthcare Volunteers

### 2007 Recommendations:

- Designate a pediatric specialty resource center and system in every regional and state disaster plan to include—at a minimum—pediatric critical care, pediatric trauma, and pediatric burn capabilities.
- Form disaster medical and psychological incident response teams capable of managing pediatric patients in every region. The Metropolitan Medical Response System (MMRS) and Community Response Teams must plan for and receive training in the care of pediatric patients. The MMRS must include appropriately trained providers and provision for pediatric equipment.
- Promote communication and consultation between facilities by availability of multiple horizontal communication systems that include patient records and medical information.
- Involve pediatric-trained providers in healthcare practitioner volunteer programs such as recruiting pediatric physicians, mid-level providers, nurses and allied health care providers into state electronic systems for the advanced registration of volunteer healthcare personnel (ESAR-

VHP). Such programs must have plans to provide pediatric-trained providers to facilities that need additional support in disaster events.

- Develop multiple systems capable of transporting pediatric patients of varying medical needs and acuity to link pediatric patient care resources.

*[Editor's note: Pediatric hospital preparedness is a complex challenge. Scenario-dependent needs may vary significantly among a variety of natural and terror-related events. Ideally, well-trained pediatric experts in relevant specialty areas, along with adequate amounts of age-appropriate equipment and supplies, would be available when and where needed. This expectation is not realistic because hospital preparedness programs, generally, have been insufficiently funded for years. Available care providers may have limited or no pediatric experience and equipment may be unavailable or makeshift. Plans for high consequence, pediatric-intense events need to be explored with innovation and flexibility.]*



## PREPAREDNESS AND RESPONSE



### **New Comments on the Maintenance of a Ready Supply of Antidotes for Emergency Use in Children During a Disaster**

#### Ensuring Adequate Supplies:

The panel feels strongly that any supply and stockpile of medications intended for the treatment of the public include an adequate supply of medications appropriate for the use in children. This represents resources such as the federal strategic national stockpile (SNS), hospital-based inventories, and caches utilized by public health departments.

#### Locating Supplies:

Supplies that are maintained with the intent of being utilized real-time during a chemical incident must be available at the intended clinical point of care without delay.

#### Determining How Much of the Supply Should be Pediatric:

Determining the appropriate amount of pediatric supplies that are required in an emergency supply or stockpile is a complex process, since children have a greater vulnerability than adults to many chemical agents, and children frequently congregate in large numbers in specific areas (e.g. schools, camps, daycare centers, etc.). We recommend that *advanced modeling techniques* be further developed to evaluate this issue. Until more resources are available, this process should be informed through the process of *hazard vulnerability assessments* combined with *population-level data* on the number of children in the area. The ultimate goal is that any stockpile of resources reflects the vulnerabilities of the entire community, including those of children, in a realistic fashion.



### **Informing the Recommendations of Medical Treatment for Children Involved in a Disaster or Terrorism Incident**

The panel strongly feels that the activities of the federal government and other officials involved in the efforts of developing medical treatment recommendations for children involved in a chemical, biological, radiological, or nuclear incident be informed through a standing pediatric advisory body available to any federal agency.

Essential characteristics of this body are:

- Has high-level expertise in pediatric medicine, preparedness, and mental health
- Meets on a regular basis to review standing recommendations for consensus
- Is available immediately to inform emergency recommendations in a disaster, such as the Emergency Use Authorization (EUA) process
- Has buy-in from key pediatric stakeholder groups and organizations
- Is federally funded but externally administered.

*[Editors' note: these recommendations are highly consistent with those currently being promoted by the National Commission on Children and Disasters]*



**Recommendations to Leverage the Federal Emergency Use Authorization (EUA) Mechanism to Properly Position Pediatric Medications for use in a Disaster**

During the novel H1N1 outbreak, the emergency use authorization mechanism (EUA) was utilized to rapidly approve oseltamivir for off-label pediatric use in an age range where it was previously not indicated. Additionally, the EUA mechanism has been successfully used to pre-position and pre-authorize the use of antibiotics for the prophylaxis of anthrax (the “pre-EUA”). The panel feels strongly that the EUA mechanism is a potential route for increasing the availability of medications for the use in children during a chemical or biological emergency, and that a pre-EUA process similar to that used for anthrax should be undertaken to maximize the availability of pediatric medical countermeasures in lieu of actual FDA approval of these medications.

Specifically we recommend:

- That the “pre-EUA” process be utilized through the “determination” and “declaration” stages of an emergency for a suite of pediatric medical countermeasure medications, prioritized by the threat and risk analysis.
- The process should be guided by an expert advisory group as noted above
- That the pharmaceutical industry be engaged in this process

*[Editor’s note: The pre-EUA is an important option to consider, but it still falls short of the ideal situation of securing FDA approval for the “on label” use of certain medical countermeasures for use in children after a disaster]*



**Recommendations on the Training of Providers to Provide Emergency Care to Children in a Disaster**

The federal government should fund the development of a course for medical first responders of all types, on the subject of assessing and treating children involved in a biologic, chemical, nuclear, or radiologic incident.

The course should be evidence-based where possible.

The course should be organized around competencies and performance measures, established by consensus.

The course should be adaptable for standardized training, as well as just-in-time education.



**Comments on Choosing First-Line Therapy for Pediatric Patients When Multiple Options Exist**

The panel offered a framework for the process of choosing a particular medical countermeasure during a disaster. Three main variables must be considered:

- Existing evidence on the efficacy and safety of the medication
- Availability of the medication
- The “operational paradigm” in existence at the time of the emergency. For example, during a plague attack it may not be possible under the conditions of a biological attack to easily obtain serum levels of gentamicin (required for safe dosing), in which case a medication such as ciprofloxacin may be a better choice overall based on the situation at hand.



**Comments on the Availability of Pediatric Formulations of Medications Used in a Disaster**

The panel acknowledges the challenges and expense involved in the production, storage, and dispensation of medications in a properly compounded oral suspension; however, the stability and reliability of a pharmaceutical-grade oral suspension is likely superior to one that is prepared ad hoc using a pill, capsule, or tablet under many circumstances. We recommend that wherever possible, children be administered pharmaceutical-grade oral suspensions for any of the medications listed.

It is important to emphasize that under some operational paradigms (as described above), this will not be possible and clear instructions must be available to both the provider and caregiver to prepare the best possible substitute for a pharmaceutical-grade oral suspension.

Where the use of a pharmaceutical-grade oral suspension is not feasible, the use of a lyophilized substance to be reconstituted is desirable over crushing a tablet or pill into a liquid.

In support of stockpiling prepared oral suspension, in a time-sensitive operational environment, such as a mass dispensation site or POD for post-exposure prophylaxis for anthrax, the demands of instructing the public on how to prepare an oral suspension may be both very labor and resource-intensive, →

and therefore the initial up-front cost may be more justifiable in terms of efforts saved during the crisis.

### **2007 Recommendations:**

Historically, we have dealt with a variety of natural and manmade disasters. The very nature of emergency preparedness requires recognition that we can never be sure of the type of emergency that may occur; for this reason, the best approach is likely to follow an “all-hazards” approach to best position ourselves to respond to the unknown with robust capacities. Based on this solid foundation, we can direct these resources to the best advantage in any specific situation. Because natural disasters and non-terrorist emergencies occur more frequently than terrorist events, preparedness procedures should be practiced and used in real situations.

The following recommendations address 1) the needs of children in all types of emergencies, including natural disasters, 2) the National Disaster Medical System (NDMS), 3) the role of the primary care provider, 4) shelters, 5) children with special health care needs, and 6) children who are displaced from their guardians either temporarily or permanently due to inability of the guardian to reach the child, or to injury or death of the guardian.

*[Editor's note: The all-hazard strategy underscored as important in the 2007 edition remains, by and large, still relevant. However, it should also be noted that certain scenarios are highly idiosyncratic. Nuclear terrorism, dirty bombs and the specific therapies associated with biological or chemical attacks require far different readiness and response strategies than, for example, pandemic influenza. The “all-hazard” approach remains a useful context to work with --in respect to preparing for general shelter or evacuation needs for family disaster planning and improved general levels of situational awareness-- as long as these approaches do not preclude the more detailed planning that is required for more specific disaster scenarios]*

## **Emergency Planning**

### **2007 Recommendations:**

- Involve pediatric specialty care experts in federal, and state local/regional disaster planning, local preparedness, and evacuation protocols of public health agencies, including emergency transport and treatment policies and processes.
- Consider pediatric needs in all federal, state, and regional/local emergency operations plans and include at least one pediatric expert on the emergency management committee of each of these agencies. Include a pediatric sub-committee in each of these agencies to provide expert guidance and ensure the needs of children are considered in all aspects of planning.

## Natural Disasters

### 2007 Recommendations:

- Include a pediatric section in all federal, state, and regional/local emergency operations plans and address the unique needs of children in all Emergency Support Functions and Annexes.
- Involve pediatric specialty care experts in federal, and state local/regional disaster planning.

## Disaster Medical Assistance Teams (DMATs) and the

## National Disaster Medical System (NDMS)

### 2007 Recommendations:

- Require that there be care providers who have specific pediatric training for all deployments, including on specialty teams.
- Include adequate supplies of pediatric equipment and pharmaceuticals in all NDMS basic loads supplied to DMATs.
- Integrate the unique needs of children (and families), including their mental health, in all training and drill programs sponsored by NDMS.
- Include assessment of availability of pediatric in-patient beds, pediatric critical care beds, and pediatric surgical and specialty beds in the NDMS assessment of bed availability. Ensure availability of pediatric in patient beds, especially for critical care, to handle increased numbers of pediatric patients.
- Ensure availability of pediatric response resources within NDMS, incorporating pediatric specialty teams or pediatric-trained members.

*[Editor's note: as noted earlier, this is clearly idealistic. All things considered, plans for responding to large-scale emergencies should also include contingency planning for deployment of non pediatric-trained clinicians to care for the children that will inevitably be present. Determining how best to adequately prepare a variety of professionals who may not have significant pediatric training – or even a comfort level in working with pediatric casualties – is essential. Equally important is the acknowledgement that the ability to provide excellent care to children after a large disaster will depend upon a synergy of both federal as well as local/state/regional assets working in concert.]*

## The Role of Urgent Care Centers and Primary Care Providers

Urgent care providers, community health centers, and primary care providers should participate in local plans to handle acute pediatric patients in addition to their normal patient load during natural disasters, terrorist events and public health emergencies. Primary care providers have numerous roles and are invaluable in pediatric terrorist and disaster preparedness. They should:

## **2007 Recommendations:**

- Prepare, regularly update, and practice an office disaster plan.
- Provide guidance on home disaster preparedness and encourage families to develop family disaster plans, which may include distribution of the Family Readiness Kit (endorsed by the American Academy of Pediatrics [AAP]).
- Be educated in issues of pediatric disaster management, including biological, chemical, and radiological events.
- Assist in developing a hospital disaster plan that ensures the proper care of children.
- Be involved in EMS (e.g., be proficient in CPR and first aid).
- Know liability and licensure issues in providing care during and after disasters.
- Participate in state and regional/local community response team planning.
- Participate in state Health Alert Network/Communications and Information Technology.
- Anticipate and prepare for loss of community services.
- Aid schools and child care facilities in developing disaster plans.
- Provide guidance to families of children with special health care needs.
- Contact volunteer organizations to provide on-site emergency and primary health care at emergency shelters, and to encourage and support community efforts to develop plans for addressing communication, transportation, and other logistics related to children in out-of-home settings.
- Advocate for inclusion of the needs of children in all federal, state, and regional/local disaster planning.
- Advocate for research on the pediatric aspects of biological, chemical, and radiological terrorism including mechanisms, pathophysiology, and treatments (including availability of appropriate medications and antidotes).

## **Shelters, Mass Feeding, and Mass Care**

### **2007 Recommendations:**

- Convene a national consensus conference on disaster sheltering of children and families that is federally funded and conducted and includes deliverables. Include parties with interests in shelter issues to establish best practices and those with expertise on issues regarding children and families.
- Support the active role of the American Red Cross in mass care and sheltering, and the roles of NDMS and public health in combination with local healthcare with regard to medical and mental health care of children and families.
- Ensure that all shelters have/can provide the items listed in Table 1.

**Table 1. Pediatric Item Requirements for Shelters**

**NUTRITION, SLEEPING ARRANGEMENTS, AND RECREATIONAL AND THERAPEUTIC ACTIVITIES APPROPRIATE FOR AGE AND STAGE OF DEVELOPMENT**

Appropriate hygiene/waste disposal resources

Basic health screening to ensure appropriate levels of available care

Safety and supervision of children around frail adults (including preventing access of children to medications)

Security of unattended or unsupervised minors

Availability of medical information resources (computers, posters, phone referral lines, etc) to aid in appropriate use of medical resources

Standardized health care data collection

Environmental considerations (smoking, alcohol, other drugs, weapons)

Secure transportation within the shelter and the medical care and resources system (transportation of shelter occupants must include appropriate official supervision of and accountability for unattended minors)

Arrangements for children with special health care needs, including providing for patients on long-term medications without affecting local emergency care resources

**Children with Special Health Care Needs (CSHCN)**

Families with children who have special health care needs will have additional considerations. Pediatricians and other healthcare providers should provide guidance to families of children with special health care needs regarding:

**2007 Recommendations:**

- Notification of utility companies to provide emergency support during a disaster as well as helping to create contingency plans should the utility company not be able to provide alternative power in the event of power loss;
- Notification of local emergency managers as to their special needs especially with regard to evacuation and sheltering;
- Maintenance of medications and equipment in case of supply disruptions during emergencies;
- Knowledge of how to obtain additional medications and equipment during times of a disaster;
- Training for family members to assume the role of in-home health care providers who may not be available during a disaster;
- Keeping up-to-date Emergency Information to provide health care workers with the patient's medical information should their regular care provider be unavailable.
- Creation of a 72 hour or longer emergency preparedness kit



## Displaced Children

### 2007 Recommendations:

- Develop plans for communication, health care delivery, contacting and reuniting displaced children and their families in communities, local school districts, and child care facilities. Integrate these plans into state, regional, and local disaster plans.
- Develop plans in government agencies for temporary medical and mental health care, shelter, guardianship, and placement of children during disaster and terrorist events in case of injured or deceased family members.
- Facilitate prompt communication among family members in community disaster plans.
- Develop evacuation plans that allow for contacting and reuniting children with their families.
- Consider development of a single-point information collection system to facilitate contacting and reuniting families in community disaster plans.
- Develop a plan to ensure documentation through the continuum of care to ensure appropriate tracking of family members.

# BIOLOGICAL, CHEMICAL, AND RADIOLOGICAL TERRORISM

Once the needs of children have been addressed in general for all types of emergencies, preparedness for specific terrorist events must be considered. Addressing the terrorism preparedness and response needs of children is particularly important. The unique physiology and anatomy of children not only make them more susceptible to terrorist agents but also may require unique therapies.

The following recommendations address the needs of children in preparedness and response to biological, chemical, and radiological terrorism including decontamination and the Strategic National Stockpile (SNS).

## Biological Terrorism



### Revision and Clarification on the Treatment or Prophylaxis of Children Exposed to Inhalational Anthrax

As with the previous guidelines, we encourage the use of one of the following first-line agents in the treatment of suspected or confirmed cases for a treatment course of 60 days.

#### INHALATIONAL ANTHRAX (THERAPY):

- Ciprofloxacin<sup>1</sup> 10-15 mg/kg IV q12h (max dose 400 mg) **or**
- Doxycycline 2.2 mg/kg IV q12h (max dose 100 mg)

PLUS

- Clindamycin 10-15 mg/kg IV q8h

PLUS

- Penicillin G 400-600k U/kg/d IV divided q4h

Under ideal individual circumstances, consultation with a pediatric infectious disease expert is recommended, as there is quite a bit of flexibility in the choices of antibiotics for secondary coverage. Instead of clindamycin or penicillin, other acceptable agents are rifampin, vancomycin, ampicillin, chloramphenicol, imipenem, clindamycin, and clarithromycin<sup>2</sup>.

After two weeks, stable patients on IV medications may be switched to an oral agent such as →

<sup>1</sup> There is a slight preference towards ciprofloxacin as a first line agent

<sup>2</sup> Update: Investigation of Bioterrorism-Related Anthrax and Interim Guidelines for Exposure Management and Antimicrobial Therapy. MMWR. October 2001 October 26, 2001: 50(42);909-919.  
([www.cdc.gov/mmwr/preview/mmwrhtml/mm5042a1.htm](http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5042a1.htm))

penicillin or amoxicillin, but only if sensitivity information is available and favorable. All treatment courses should be 60 days.

- Amoxicillin 40-80 mg/kg/day orally divided q8h

The prophylaxis of pediatric cases is also conducted for 60 days, via the oral instead of parenteral route.

INHALATIONAL ANTHRAX (PROPHYLAXIS):

- Ciprofloxacin 10-15 mg/kg orally twice a day (max dose 400 mg) **or**
- Doxycycline 2.2 mg/kg orally twice day (max dose 100 mg)

Levofloxacin may be an acceptable alternative as a first line medication for treatment or prophylaxis, but there is incomplete safety information for the use of this medication in pediatric patients beyond 30 days.

- Levofloxacin 10-15 mg/kg IV q24h

In a mass dispensation setting, it may be necessary to substitute oral therapy for treatment, using the same medications/dosages as for prophylaxis.

Third generation cephalosporins should not be utilized (ceftriaxone, ceftazidime).

Extended treatment regimens are indicated because of the sporulated form of the bacterium which can persist in the patient.

Operational limitations may require the use of oral medications for *treatment* after an undetected mass exposure



**Updates to the Recommendations on the Treatment of Pediatric Patients Exposed to Smallpox**

For pediatric patients diagnosed with symptomatic smallpox, the primary therapy remains supportive care.

For pediatric patients, the primary medical intervention for post-exposure prophylaxis is vaccination with *vaccinia* as soon as possible, regardless of age.

The panel felt that there is a potential role for the antiviral medication cidofovir (Vistide®) as a second-line drug in the treatment of pediatric adverse reactions to *vaccinia* administration. Consultation with a pediatric infectious disease specialist is required, and the medication is available through the CDC under Investigational New Drug (IND) protocols. →

Similarly, there may be a potential role for *vaccinia* immune globin (VIG) in the treatment of pediatric patients experiencing an adverse reaction to inoculation with *vaccinia*.

More information on acquiring these medications for use are at

<http://www.bt.cdc.gov/agent/smallpox/vaccination/mgmt-adv-reactions.asp>

*[Editor's note: Unlike with other recommendations, the 2009 panel did not feel comfortable reaching a hard conclusion with respect to use of cidofovir or VIG]*



### Comments on the Novel H1N1 Influenza Outbreak in 2009 in the United States

The panel acknowledges that there were many successes in the recent response to novel H1N1, especially with regards to information sharing from the federal government

It was observed that there was a significant shortfall in the ability of the public health system to function as a coordinated network of stakeholders– from the CDC to the state and local health departments, and including the clinical providers, media, schools, and the public. Specifically, the panel emphasized the need for a more effective way to engage both the public and providers in understanding the risk to the public of the outbreak, and what actions were appropriate to take. As a result, a largely preventable “ambulatory surge” of patients converged on the emergency departments and to the offices of primary care clinicians. This was discussed as a “failure of percolation” of the information from the CDC through the network of public health stakeholders. Specific examples include recommendations around personal protective equipment (especially masks) as well as infection control techniques.

Despite extensive planning for a pandemic emergency in the past five years, many of the efforts did not anticipate either a pediatric or ambulatory surge in demand as was observed.

The panel recommended that more clarity is needed in terms of which agencies are advisory in nature (e.g. the CDC) and which are regulatory in nature (e.g. OSHA, state departments of health), and that the efforts be better coordinated between them.

Much greater support is required from the state and federal governments to support the local efforts towards preparedness and surge planning. Recommendations include the possibility of reimbursements or incentives for increasing surge capability and training.

The panel emphasized the need to regard the Spring 2009 outbreak as a “national preparedness exercise” and to aggressively develop after-action information from all groups that were involved.

These need to be quickly translated into “lessons learned” and a prioritized list of action items →

established.

A model suggested was one similar to the “9/11 Commission” but with a shorter timeline.

The panel emphasized that developing a better understanding of how to engage the public in the messaging around a disaster was one of the most critical observations from the recent outbreak. A failure to move trustworthy, actionable public health information to the public will inevitably result in a recurrence of the surge in demand for care that was observed in some areas most heavily affected.

## Immunotherapy and Immunoprophylaxis

### 2007 Recommendations:

- Include provisions for study and/or use in children in any new investigational vaccine studies.
- **Anthrax:** The currently licensed vaccine (Biothrax<sup>®</sup>, Bioport Corporation) is approved for adults. This vaccine is recommended (under IND application or emergency use authorization) by the CDC as a three-dose series (at 0, 2, and 4 weeks) to accompany post-exposure chemoprophylaxis. The recommendation is put forth, in part, to guard against difficulties in compliance with the 60-day antibiotic regimen. While there is no data to support similar use in children, we advocate that safety studies in children be undertaken and that clinicians caring for children consult with public health officials regarding use of anthrax vaccine, should an attack occur. Moreover, we advocate that future studies of new generation anthrax vaccines include children.
- **Smallpox:** The currently licensed smallpox vaccine (Dryvax, Wyeth, Philadelphia, PA) makes no mention in its package insert of an approved age range. In practice, until the early 1970s, this vaccine was administered to those over 12 months of age. The CDC currently recommends against vaccination of children younger than 1 year. All contraindications to smallpox vaccination are relative. After bona fide exposure or known usage of weaponized smallpox, even the youngest exposed at-risk infants should be vaccinated. Moreover, future studies of new generation vaccines must include children.
- **Botulism:** A licensed bivalent (types A and B), as well as an investigational type E antitoxin, are available through the CDC. These antitoxins are to be used in children of any age known to have been exposed to botulinum toxin of the appropriate serotypes. A licensed pentavalent Botulinum Immune Globulin (human) is available through the California Department of Health specifically for the treatment of botulism in infants. Although licensed specifically for use in Infant Botulism due to Toxin Types A & B, it may have a role for use in the treatment of Bioterrorism victims resulting from exposures to these Toxin Types, as well as to Toxin Types C, D and E. The study of this product must be continued and that licensure be pursued.
- **Plague: No licensed plague vaccine is currently in production.** A previously licensed vaccine was approved only for persons 18-61 years old.

## Physical Protection

- Under most circumstances, there is little role for physical protection against bioterrorism agents

in a civilian population. Although some companies are marketing devices such as gas masks for children, we think the risks of using these are likely to outweigh the benefits.

- Research into future means of physical protection must consider the needs of children.

**Table 2. Recommended Therapy and Prophylaxis of Anthrax (Pediatric)**

FORM OF ANTHRAX	CATEGORY OF TREATMENT (THERAPY OR PROPHYLAXIS)	AGENT AND DOSAGE
Inhalational	Therapy (60-day course)	See above recommendations
Inhalational	Postexposure prophylaxis (60-day course)	See above recommendations
Cutaneous (in setting of terrorism)	Therapy	Ciprofloxacin 10-15 mg/kg PO (max 1 gm/day) q12h or Levofloxacin <sup>3</sup> 10-15 mg/kg IV q24h Doxycycline 2.2 mg/kg PO (max 100 mg) q12h
Gastrointestinal	Therapy	Same as for inhalational

This table was created from recommendations developed at the Consensus Conference and in part is based on reviewed reference materials from the AAP, CDC, FDA, and Infectious Disease Society of America

<sup>3</sup> There is incomplete safety information on the prolonged (>30-day) use of levofloxacin

**Table 3. Recommended Therapy and Prophylaxis in Children for Additional Select Diseases Associated with Bioterrorism (Pediatric)**

DISEASE	THERAPY OR PROPHYLAXIS	TREATMENT, AGENT, AND DOSAGE
Smallpox	Therapy	Supportive care
	Prophylaxis	Immediate vaccination
Plague	Therapy	Gentamicin 2.5 mg/kg IV q8h <b>or</b> Streptomycin 15 mg/kg IM q12h (max 2 gm/day, although only available for compassionate usage and in limited supply) <b>or</b> Doxycycline 2.2 mg/kg IV q12h (max 200 mg/day) <b>or</b> Ciprofloxacin 15 mg/kg IV q12h <b>or</b> Levofloxacin 10-15 mg/kg IV q24h <b>or</b> Chloramphenicol 25m/kg 6qh (max 4 gm/day)
	Prophylaxis	Doxycycline 2.2 mg/kg PO q12h <b>or</b> Ciprofloxacin 20 mg/kg PO q12h
Tularemia	Therapy	Same as for plague
Botulism	Therapy	Supportive care, antitoxin and/or botulism immune globulin may halt progression of symptoms but are unlikely to reverse them
Viral hemorrhagic fevers	Therapy	Supportive care Ribavirin may be beneficial in select cases
Brucellosis	Therapy <sup>e</sup>	TMP/SMX 30 mg/kg PO q12h and rifampin 15 mg/kg q24h or gentamicin 7.5 mg/kg IM qd × 5

This table was created from recommendations developed at the 2007 Consensus Conference and in part is based on reviewed reference materials from the AAP, CDC, and Infectious Disease Society of America

## Chemical Terrorism

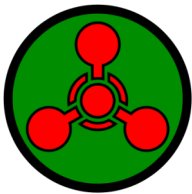


### Updated Recommendations on the Use of Nerve Agent Antidote Kits in Infants and Children

Immediately use a nerve agent antidote kit (NAAK) such as the Mark-1® or DuoDote® device for initial emergent therapy in any pediatric victim with evidence of nerve agent toxicity. Do not delay treatment in an effort to obtain IV access.

For pediatric victims that continue to be symptomatic, repeat the administration of the NAAK as needed. If intravenous access and the appropriate medications are immediately available, IV atropine and IV pralidoxime dosing is an acceptable alternative.

Further research is required and recommended on the pharmacokinetics of the oxime component of the NAAK in children. Until this information is available, we feel that it is in the best interest of children that they receive the above listed treatment regime for suspected nerve agent toxicity to stabilize the patient.



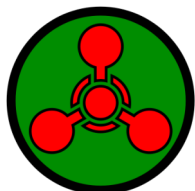
### Development and Stockpiling of a Pediatric Autoinjector Kit Containing Both Atropine and Pralidoxime

Due to the operational complexity of stockpiling and maintaining unexpired pediatric NAAKs, as well as the need for additional training on separate devices, we do not recommend that the approval and widespread pre-positioning of a pediatric-specific NAAK be undertaken in the United States in the current preparedness environment. The emphasis should be on the maintenance of a single type of NAAK that can be used as initial therapy in all symptomatic patients, and on ensuring that unexpired NAAKs are immediately available for patient care during an incident. →



Pediatric dosages of atropine in an autoinjector are now available, however as described above, the practicality of an emergency treatment protocol that utilizes four types of atropine autoinjectors (3 pediatric dosages at 0.25, 0.5, and 1 mg and the adult 2 mg size) during a nerve agent incident has been called into question. As an alternative to the “one size for all” recommendation that the panel has put forth, we acknowledge that certain jurisdictions may have a greater capacity to store, train with, and utilize pediatric autoinjectors. Under these circumstances, the field use of one size of pediatric autoinjector may be realistic and desirable as an option.

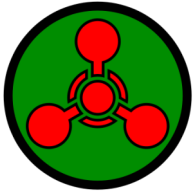
*[Editor’s note: for more information see: Foltin G, Tunik M, Curran J, et al. Pediatric nerve agent poisoning: medical and operational considerations for emergency medical services in a large American city. Pediatr Emerg Care 2006;22:239-44]*



**Recommendations on the Use of a Pediatric Atropine-only Autoinjector (such as the Atropen®)**

Due to the operational challenges of maintaining and using a separate atropine-only autoinjector, and considering the limited use of such a device in a nerve agent attack (for 2<sup>nd</sup> and subsequent doses in a symptomatic pediatric patient), we do not recommend the widespread pre-positioning of this type of device. The panel felt that the emphasis should be on the maintenance of a single NAAK that can be used as initial therapy in all symptomatic patients of any age, and on ensuring that unexpired NAAKs are immediately available for patient care during an incident.

In certain jurisdictions where the use, purchase, or storage of a single NAAK for use on both adult and pediatric patients is not allowable, there may be a limited role for the use of the atropine-only pediatric autoinjectors as a component of the emergent treatment of children exposed to nerve agents.



## Updates to Recommended Chemical Antidotes for Children

The following medications have significant roles as chemical antidotes and should be immediately available to children seen in an emergency medical facility who may have been exposed to a chemical agent.

Atropine: 0.05 mg/kg IV or IM (dosing range 0.1 mg to 5 mg), repeat every 2 to 5 minutes for continued symptoms. See information above regarding atropine autoinjectors and NAAKs.

Pralidoxime: 25 mg/kg IV, IM (max dose 1 g IV or 2 g IM), consider repeating hourly x 1 or 2 doses for persistent symptoms.

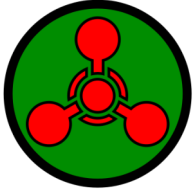
Benzodiazepine (examples: Midazolam, Lorazepam, or Diazepam) as injectable supply or as an autoinjector. A pediatric midazolam autoinjector, available in 5mg and 10mg, is currently in development and review.

- Midazolam IM 0.2 mg/kg (max 10mg) [first choice]
- Lorazepam IV/IM 0.1 mg/kg (max 4mg)
- Diazepam IV 0.3 mg/kg (max 10 mg)

There may be a role for British anti-lewisite (BAL) for the treatment of heavy metal toxicity such as arsenic.

- BAL 3 mg/kg IM every 4-6 hrs as needed

Cyanide antidote kits should be available (see below).



### **Updated Recommendation on Hydroxocobalmin for the Treatment of Cyanide Toxicity in Children**

We recommend the addition of hydroxocobalmin (vitamin B-12, Cyanokit®) to the list of options to treat cyanide toxicity in a disaster. This is a newly FDA-approved treatment option for adult and pediatric cyanide toxicity which has been used widely outside the U.S. and is typically well tolerated.

- Hydroxocobalmin 70 mg/kg (max of 5 mg), repeat as needed x 1

Cyanide antidote kits (CAK) containing sodium nitrate and sodium thiosulfate should be available for immediate use in all emergent clinical settings. Isoamyl nitrate for inhalation is not well evaluated for pediatric use and is frequently not used in pediatric patients.

As with all chemical medical countermeasures, it should be emphasized that the treatment is very time-sensitive, and must be available as close as possible to the point of care without delay. Centralized stockpiling of medical countermeasures for chemical agents is likely of limited utility.

#### **2007 Recommendations:**

- Make an organized body of knowledge regarding chemical weapons readily available to pediatric and emergency services health care professionals. Include details on the known pediatric toxicology of chemical weapons, with management protocols based on a consensus guideline development process, and real-time contact resources (e.g., poison control centers, CDC, etc).
- Publicly disseminate a condensed version of this information and include advice on the mental health care of children. This information should be reviewed by professional organizations and/or government agencies to ensure that it is appropriate for the general public.
- Include pediatric and mental health input in decontamination and treatment protocols in state, regional, and local EMS plans. This implies some national consensus process for hospital-based decontamination.

**Table 4. Recommended Treatment and Management of Chemical Agents Used in Terrorism**

AGENT	TOXICITY	CLINICAL FINDINGS	ONSET	DECONTAMINATION <sup>a</sup>	MANAGEMENT
<b>NERVE AGENTS</b>					
Tabun, Sarin, Soman, VX	Anticholinesterase: muscarinic, nicotinic, and CNS effects	Vapor: miosis, rhinorrhea, dyspnea	Vapor: seconds	Vapor: fresh air, remove clothes, wash hair	See above recommendations for stabilization of patient using nerve agent antidote kits  After patient is stabilized, therapy options include:  Atropine IV 0.05 mg/kg IV/IM/IO (min 0.1mg, max 5mg) Repeat as necessary
		Liquid: Diaphoresis, Vomiting  Both: coma, paralysis, seizures, apnea, death	Liquid: minutes to hours	Liquid: remove clothes, copious washing of skin and hair with soap and water, ocular irrigation	Pralidoxime 25 mg/kg IV/IM/IO Consider repeat q1hr PRN continued symptoms  Benzodiazepenes for seizure control
<b>VESICANTS</b>					
Mustard	Alkylation	Skin: erythema, vesicles  Eye: inflammation Respiratory tract: inflammation, respiratory distress, acute respiratory distress syndrome	Hours	Skin: soap and water  Eyes: irrigation (water) Both: major impact only if done within minutes of exposure	Symptomatic care
Lewisite	Arsenical		Immediate pain		Possibly British anti-lewisite (BAL) 3 mg/kg IM q4-6h for systemic effects of lewisite in severe cases
<b>PULMONARY AGENTS</b>					
Chlorine, phosgene	Liberate HCl, alkylation	Eyes, nose, throat, irritation (especially chlorine)	Minutes	Fresh air  Skin: water	Symptomatic care
		Bronchospasm, pulmonary edema (especially phosgene)	Bronchospasm: minutes Pulmonary edema: hours		

Cyanide	Cytochrome oxidase inhibition: cellular anoxia, lactic acidosis	Tachypnea, coma, seizures, apnea, death	Seconds	Fresh air Skin: soap and water	<p>Airway, breathing, circulatory support; 100% oxygen Sodium bicarbonate prn for metabolic acidosis</p> <p><u>Recommended first line agent:</u></p> <p>Hydroxocobalmin IV 70 mg/kg (max 5 mg)</p> <p>Repeat as needed x 1</p> <p><u>Alternative treatment:</u></p> <p>Sodium nitrite (3%):</p> <table border="1"> <thead> <tr> <th>Dosage (mL/kg)</th> <th>Estimated Hgb (g/dL) For average child</th> </tr> </thead> <tbody> <tr> <td>0.27</td> <td>10</td> </tr> <tr> <td>0.33</td> <td>12</td> </tr> <tr> <td>0.39</td> <td>14</td> </tr> </tbody> </table> <p>Max 10 mL</p> <p>Sodium thiosulfate (25%) 1.65 mL/kg (max 50 mL)</p>	Dosage (mL/kg)	Estimated Hgb (g/dL) For average child	0.27	10	0.33	12	0.39	14
Dosage (mL/kg)	Estimated Hgb (g/dL) For average child												
0.27	10												
0.33	12												
0.39	14												

#### RIOT CONTROL AGENTS

CS, CN (Mace®) capsaicin (pepper spray)	Neuropeptide substance P release, alkylation	Eye: tearing, pain, blepharospasm Nose and throat irritation Pulmonary failure (rare)	Seconds	Fresh air Eye: lavage	Irrigation, symptomatic care
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<sup>a</sup> Decontamination, especially for patients with significant nerve agent or vesicant exposure, should be performed by health care providers garbed in adequate personal protective equipment. For emergency department staff, this consists of non-encapsulated, chemically resistant body suit, boots, and gloves with a full-face air purifier mask/hood.

<sup>e</sup> Pralidoxime is reconstituted to 50 mg/mL (1 g in 20 mL water) for IV administration, and the total dose infused over 30 min, or may be given by continuous infusion (loading dose 25 mg/kg over 30 min, then 10 mg/kg/hr). For IM use, it might be diluted to a concentration of 300 mg/mL (1g added to 3 mL water—by analogy to the US Army's Mark-1 autoinjector concentration), to effect a reasonable volume for injection. Pediatric autoinjectors of pralidoxime are not FDA approved or available.

Key: ABCs = airway, breathing and circulatory support; BAL= British Anti-Lewisite; Hgb= hemoglobin concentration; est.= estimated hemoglobin concentration; max = maximum; min = minimum; prn = as needed.

This table was created from recommendations developed at the Consensus Conference and in part is based on reviewed reference materials from the American Academy of Pediatrics, Centers for Disease Control, FDA and adaptation from work done and published as Henretig FM, Cieslak TJ, Eitzen EM Jr. *J Pediatr* 2002; 141:311-326. Used with permission.

## Radiologic Terrorism

One of the most significant operational concerns during a radiological disaster involving a nuclear power plant is the dispensation and use of potassium iodide. This medication is traditionally stored as a hard tablet for adult dosing, despite the fact that children will benefit the most from its use. Tableted potassium iodide requires significant effort to be converted into a pediatric formulation. Additionally, there are critical time-sensitive needs to dispense the medication to those in need.

Generally speaking, KI is not indicated after a nuclear detonation where medical countermeasures will be focused much more on the delivery of first aid and stabilization care initially. Afterwards, there may be a significant need for more advanced medical countermeasures to support the expected blood disorders such as neutropenia and anemia which may follow, as well as a very high demand for health care services of all kinds.

*[Editor's note: At a later date, the NCDP will release a report specifically focused on the management of children exposed to excessive radiation as a result of a major radiological events, including those involving nuclear power plants, radiological dispersion devices or improvised nuclear devices (INDs).]*

### 2007 Recommendations:

- Develop plans and distribution systems in all localities that provide for potassium iodide (KI) administration within 2 hr of exposure to radioactive iodine to ensure that all children who need KI can receive it. (KI is a proven intervention for victims exposed to radioiodines in order to prevent thyroid cancer.) Determination of need for KI should be based on a community risk assessment to determine (based on possible events) what population of children would receive the minimal exposure of 5cGy which would require treatment. Typically this is a minimum of a 10-mile radius but could be as large as a 50-mile radius.
- Adhere to graded dosing of KI whenever possible. If local emergency planners conclude that graded dosing is logistically impractical for populations at risk of radioiodine exposure, the overall benefits of receiving 130 mg of KI instead of the lower doses recommended for certain age groups far exceed the small risks of overdosing.
- If KI dosing based on projected thyroid radioactive exposure is logistically impractical during a radiological emergency, administer KI to children at the lowest possible threshold that is  $\geq 5\text{cGy}$  projected internal thyroid exposure in children.
- On 12 January 2005, the FDA approved a liquid pediatric preparation of KI (ThyroShield™), containing 65 mg of KI per mL. Given this, *we believe that the liquid preparation or future liquid preparations for children should be made widely available and become the preferred dosing form for young children.*
- Involve pediatric experts in the development of plans for a safe and effective response to a radiation event. This is essential because children are significantly more affected by radiation exposure than are adults.
- Increase the knowledge base among all pediatric care providers about medical and psychological aspects of radiation exposure.
- Except as stated above, ensure that the dosing of KI conforms to Tables 6, 7, and 8.
- Ensure availability of appropriate marrow stimulative agents for children who may be victims of radiologic terrorism or radiologic exposure through a non-terrorism event. The marrow stimulative agents available and their dosages are listed in Table 8.

- Include in all medication availability for radiologic exposure anti-emetics to treat the emesis caused by this exposure and prevent dehydration for which children have increased susceptibility.
- Ensure availability of all of the medications listed in Table 10 for treatment of radiological internal contamination and that all testing of these agents and treatment protocols for these agents include considerations for the treatment of children.
- Prussian Blue (Radiogardase<sup>®</sup>) was approved by the FDA in 2003 (as 500-mg capsules) for the treatment of internal <sup>137</sup>Cs contamination. Because such treatment is not “time-critical,” and because the “dirty bomb” that might be expected to provide the exposure to <sup>137</sup>Cs would likely affect only modest numbers of people, we do not think it necessary to advocate stockpiling large amounts of Prussian Blue in forward locations. Pediatric dosing recommendations are provided in Table 11

**Table 6. Guidelines for KI Dosing and Administration**

PATIENT AGE	EXPOSURE, Gy (RAD) (Minimum threshold for treatment)	KI DOSE	
		<i>mg</i>	<i>65 mg/mL solution</i>
>40 yr	>5 (500)	130	
18–40 yr	0.1 (10)	130	
12–17 yr	0.05 (5)	65	1 mL
4–11 yr	0.05 (5)	65	1 mL
1 mo–3 yr	0.05 (5)	32	0.5 mL
Birth–1 mo	0.05 (5)	16	0.25 mL
Pregnant/lactating	0.05 (5)	130	

This table was created from recommendations developed at the Consensus Conference and in part is based on reviewed reference materials from the American Academy of Pediatrics, Centers for Disease Control, and FDA.

**Note:** Children/adolescents weighing >70 kg should receive the adult dose (130 mg).

**Table 7. Guidelines for Home Preparation of KI Solution Using 130-mg Tablet**

These guidelines allow for preparation of a pediatric solution from tablets when a pediatric solution is not available.

Put one 130-mg KI tablet in a small bowl and grind into a fine powder with the back of a spoon. The powder should not have any large pieces.
Add 4 tsp (20 mL) of water to the KI powder. Use a spoon to mix them together until the KI powder is dissolved in the water.
Add 4 tsp (20 mL) of milk, juice, soda, or syrup to the KI and water mixture. KI mixed with any of the recommended drinks will keep for up to 7 days in the refrigerator.
The resulting mixture is about 16 mg of KI per teaspoon (5 mL).
Age-based dosing guidelines: Newborn through 1 month of age = 1 tsp 1 month through 3 years of age = 2 tsp 4 years through 17 years of age = 4 tsp Children/adolescents weighing more than 70 kg should receive one 130-mg tablet.

This table was created from recommendations developed at the Consensus Conference and in part is based on reviewed reference materials from the American Academy of Pediatrics, Centers for Disease Control, and FDA.

**Table 8. Guidelines for Home Preparation of KI Solution Using 65-mg Tablet**

Put one 65-mg KI tablet in a small bowl and grind into a fine powder with the back of a spoon. The powder should not have any large pieces.
Add 4 tsp (20 mL) of water to the KI powder. Use a spoon to mix them together until the KI powder is dissolved in the water.
Add 4 tsp (20 mL) of milk, juice, soda, or syrup (e.g., raspberry) to the KI and water mixture. Potassium iodide mixed with any of the recommended drinks will keep for up to 7 days in the refrigerator.
The resulting mixture is about 8 mg of KI per teaspoon (5 mL).
Age-based dosing guidelines: Newborn through 1 month of age = 2 tsp 1 month through 3 years of age = 4 tsp 4 years through 17 years of age = 8 tsp or one 65-mg tablet Children/adolescents weighing more than 70 kg should receive two 65-mg tablets.

This table was created from recommendations developed at the Consensus Conference and in part is based on reviewed reference materials from the American Academy of Pediatrics, Centers for Disease Control, and FDA.



**Table 9. Marrow Stimulative Agents**

<b>AGENT</b>	<b>ACTION</b>	<b>DOSAGE<sup>b</sup></b>
Epoetin alpha <sup>a</sup> (Epoen, Procrit)	Induces erythropoiesis	150 units/kg/dose
Filgrastim (Neupogen)	Granulocyte colony stimulating factor (GCSF)	2.5-5 mcg/kg/day (dosages of 20 mcg/kg/day may be needed in selected patients)
Sargramostim (Leukine)	Colony stimulating factor (AMCSF)	5-10 mcg/kg/day (dosages of 30 mcg/kg/day may be needed in selected patients)

<sup>a</sup> Epoetin alpha may also be useful to reduce the overall requirements for blood transfusion in any mass casualty incident.

<sup>b</sup> Dosage derived from Medical Management of Radiological Casualties, Armed Forces Radiobiology Research Institute, 1999, and accepted dosages for pediatric oncology and pediatric congenital neutropenia and erythropenia patients.

**Table 10. Radionuclides Produced After Radiologic Terrorism or Disaster, Internal Contamination, Toxicity and Treatment**

<b>ELEMENT</b>	<b>RESPIRATORY ABSORPTION</b>	<b>GI ABSORPTION</b>	<b>SKIN WOUND ABSORPTION</b>	<b>PRIMARY TOXICITY</b>	<b>TREATMENT</b>
Americium	75%	Minimal	Rapid	Skeletal deposition, marrow suppression, hepatic deposition	Chelation with DTPA or EDTA
Cesium	Complete	Complete	Complete	Whole body irradiation	Prussian blue
Cobalt	High	<5%	Unknown	Whole body irradiation	Supportive
Iodine	High	High	High	Thyroid ablation, carcinoma	Potassium iodide
Phosphorus	High	High	High	Bone, rapidly replicating cells	Aluminum hydroxide
Plutonium	High	Minimal	Limited, may form nodules	Lung, bone, liver	Chelation with DTPA or EDTA
Radium	Unknown	30%	Unknown	Bone marrow suppression, sarcoma	Magnesium sulfate lavage
Strontium	Limited	Moderate	Unknown	Bone	Supportive
Tritium	Minimal	Minimal	Complete	Panmyelocytopenia	Dilution with controlled water intake, diuresis
Tritiated water	Complete	Complete	Complete	Panmyelocytopenia	Dilution with controlled water intake, diuresis
Uranium	High	High to moderate	High absorption, skin irritant	Pulmonary, nephrotoxic	Chelation with DTPA or EDTA, NaHCO <sub>3</sub> to alkalinize urine

**Table 11. Prussian Blue Dosing**

Prussian Blue (Radiogardase<sup>®</sup>) was approved by the FDA in 2003 (as 500-mg capsules) for the treatment of internal <sup>137</sup>Cs contamination. Dosing instructions are as follows:

AGE	DOSE
Adults and adolescents	3 g (6 capsules*) PO tid.
Children 2–12 yr old	1 g (2 capsules*) PO tid

\*Capsules may be opened and the contents mixed with food or beverages.

# DECONTAMINATION, QUARANTINE, AND ISOLATION

## 2007 Recommendations:

- Design decontamination systems so that they can be used for decontamination of children of all ages (including infants), of the parentless child, of the non-ambulatory child, and of the child with special health care needs.
- Address the following pediatric considerations in all federal, state, and regional/local protocols and guidance for decontamination: 1) water temperature and pressure (high-volume, low-pressure, heated water systems), 2) non-ambulatory children, 3) children with special health care needs, and 4) clothing after decontamination.
- Assure that quarantine facilities adhere at a minimum to the guidelines for shelters and that they address the ability to quarantine families together and also have in place a program for identification of children and reunification with their guardians.
- Whenever operationally possible, provide isolation as a family unit.

*[Editor's note: In addition to isolation, the ability to perform decontamination as a family is essential. It is unrealistic to assume that children will be decontaminated at a separate facility from their caregiver. For an excellent overview of this issue, please see the DVD developed by Dr. Michael Shannon: <http://www.ahrq.gov/research/decontam.htm>]*

## Strategic National Stockpile (SNS)

### 2007 Recommendations:

- Address the unique needs of children in the SNS by assuring 1) availability in all phases of an emergency response, 2) determination of percentage of supplies by age and weight, 3) pediatric dosing and formulations, 4) current, individualized packing, and 5) pediatric expertise incorporated into the SNS program, as well as in planning and implementation.
- Coordinate distribution of pediatric specific supplies, including SNS, in state and regional/local disaster plans.
- Require external review by a federal multidisciplinary pediatric advisory board for all federal, state, and regional/local equipment and pharmaceutical stock piles.

## MENTAL HEALTH NEEDS

Children's mental health and resilience building are essential aspects of all phases of emergency preparedness including response, recovery, and mitigation. The following recommendations address the mental health needs of children before, during and after a disaster.

### Recommendations for Mental Health Preparedness in Children

*[Editors' note: While this section was not discussed by the 2009 panel, we believe that all recommendations from the 2007 edition remain applicable. We also support the recommendations in this matter currently being drafted by the National Commission on Children and Disasters. More information on the NCCD's recommendations are available at <http://www.childrenanddisasters.acf.hhs.gov/>]*

#### 2007 Recommendations:

- Incorporate mental health needs of children in the preparedness planning of federal, state, and regional/local government agencies. Avoid separating planning for safety, security, and other health needs from planning for mental health needs. Reviewing and incorporating existing international disaster preparedness guidelines could facilitate the improvement of planning in the United States.
- Substantial research has suggested that children learn and integrate information differently depending on their chronological and developmental level. Developmental issues need to be taken into account when developing disaster preparedness intervention guidelines to increase the child's receptiveness and ability to benefit from these interventions.
- Recognize factors that place children at risk and act proactively to help improve the mental health infrastructure for those children and their families. This includes the creation of a network or system that improves referral mechanisms and information about available resources. This "registry" should be updated bimonthly and include information on mental health providers describe their specialties, languages spoken, cultural competencies, etc.
- Children need to be engaged as active participants during disaster preparedness and throughout the resiliency process. Issues related to age, cognitive development and current skill level need to be taken into account to increase the potential for empowering and educating children. Successfully engaging children throughout the resiliency process will increase their self-efficacy, coping and overall resiliency to disaster.
- Risk communication needs to be more effectively implemented. Recognize and consider the mental health implications of announcements in the media and responsibly communicate messages to caregivers. This involves taking into account recipients' literacy level, access to resources and the assessment of the trust of public messages.
- Currently, many children are not receiving needed mental health services. For example, in New York, only 10% of children receive mental health education in their schools. Attention by schools to mental health needs of children should be seen as an equally important aspect of their

educational mission. Education preparedness needs to take into account the child's level of development to increase the potential for learning and retaining presented information.

- Recognize limitations in preparedness that may impact preparedness activities. These limitations can be proactively addressed by requiring training for all medical and mental health professionals who will be working with children to understand and encourage resilience as well as to appropriately assess, treat and provide referrals.
- Create a national emergency mental health funding mechanism to pre-authorize generic crisis response plans that address the mental health needs of children and families.
- Disaster is not an isolated event and continues to affect people throughout their life. Due to the long range implications and effects of disaster, it is essential that all disaster plans include vast resources for assessing and treating child mental health issues and concerns throughout the child's lifespan.
- Provide leadership by the US Department of Education to emphasize the importance of addressing children's mental health needs before, during, and after a disaster. Funding must be made available to local boards of education to support these activities and to form partnerships with mental health providers and organizations.
- Professionals who care for children need to be trained to understand mental health issues impacting children post-disaster. This includes having a better understanding and practice with differential diagnosis for disorders such as PTSD, ASD, adjustment, anxiety and mood disorders. Implementing training programs for graduate students can help to broaden the understanding of mental health issues that impact children for these future practitioners.
- Provide training to pediatricians, family doctors, mental health professionals and other caregivers on the importance of encouraging the utilization of traditional support systems such as clergy, extended family, and community agencies when in distress.
- Develop guidelines and mechanisms for the coordination among federal, state, and regional/local agencies for mental health services during a crisis. Include mental health needs in the Incident Command System.
- Allow for flexibility in funding, recognizing that children and families are vulnerable to a wide range of short-and long-term changes in the aftermath of disasters and emergencies including: posttraumatic stress reaction, grief, fear, depression, anxiety, sleep disturbances, and behavioral difficulties in various settings.
- Establish community agencies dedicated to resilience fostering and disaster preparedness as their main mission. These agencies can focus on encouraging self-efficacy, communication, and ways to involve all members of the family in age-appropriate preparedness activities.
- Ensure the understanding of resilience building in children and families as essential in preparedness

## **Mental Health Needs of Children during Disaster and Terrorist Events**

### **2007 Recommendations:**

- Provide federal funding for mental health care of children and families after a disaster to include

both screening and therapy. Funding must be sufficiently flexible to allow for a response tailored to the needs of local communities that does not exclude those with pre-existing mental health problems.

- Ensure that children with pre-existing mental health conditions are not excluded from eligibility for mental health care after a disaster or crisis. Such children may be especially vulnerable to post-traumatic stress reactions and a range of other mental health problems after the event.
- Set time limits on government funding for mental health intervention based on clinical evaluation. Mental health problems in children may present soon after a disaster or persist over long periods of time. Even children who do not meet full criteria for a mental health diagnosis may have significantly impaired functioning and need intervention.
- Provide public information about the immediate and long-term effects of disasters to help parents, teachers, pediatricians, and other community service providers identify children suffering from long-term effects.
- Commission mental health professionals in the media to provide information to caregivers on how to help children cope during times of stress (anniversaries of the event, holidays, life changes, threats, etc).
- Recommend a family-centered approach that includes assessment, early intervention, and treatment with primary caregivers and other family members. Additionally, incorporate nonclinical approaches to treatment that may be effective with some child particular populations. Interventions should always be culturally and linguistically appropriate and would ideally engage the parent as a treatment collaborator.
- Support parents' mental health and concrete needs. Research has shown that appropriate parental functioning after a disaster is a protective factor for children's mental health functioning.
- Take into account cultural, socioeconomic, community, history, risk, and vulnerability factors when preparing and implementing interventions in particular communities. It is essential that multicultural issues are reviewed when developing intervention guidelines for different members of the community.
- Children and families heal as communities heal and find ways to cope with new realities. As such, it is important to keep in mind community recovery as essential and positively correlated to individual recovery.

## SCHOOL PREPAREDNESS AND RESPONSE

Because children spend a significant amount of their day and their lives in school, all efforts in emergency preparedness must include school preparedness. Schools cannot engage in preparedness efforts as isolated units but must fully integrate their efforts with all local/regional, state, and national preparedness plans.

To ensure that protocols are consistent with the expectations of officials in emergency management and public safety, emergency planning of schools must follow the four recognized phases of emergency management: mitigation, preparedness, response, and recovery. In all phases, the recommendations below refer to schools and other facilities where children congregate.

While schools are generally familiar with conducting single agency drills for fire and bomb scares or shelter-in place drills for events like earthquakes, hurricanes, or the release of an airborne toxic substance, schools must also conduct exercises that include multiple government agencies to ensure that their needs will be met during a large-scale disaster.

School officials must develop relationships with their public safety partners to ensure that they are invited to be a participant in community and regionally based tabletop exercises. Since the size and complexity of school systems present such a unique set of challenges, schools should also host and conduct internal tabletop exercises to ensure that stakeholders (including parents and media) and outside agencies are able to implement appropriate plans and effectively identify, allocate, and use resources during a critical incident.

Exercises designed to test and evaluate responses should be done regularly with chief school personnel and local emergency responders. When used in conjunction with other means of testing emergency preparedness (such as drills and functional or full-scale exercises), tabletop exercises can be an effective means of clarifying roles and responsibilities, while simultaneously improving coordination between the school district, the community, and public safety responders.

### Prevention and Mitigation Phase

#### 2007 Recommendations:

- Identify local hazards and vulnerabilities.
- Review the last safety audit to examine school buildings and grounds.
- Determine who is responsible for overseeing prevention and mitigation strategies in the school.
- Provide staff the opportunity and forum to provide input and feedback on potential school dangers.
- Review past incident information/data.
- Discuss the hazard vulnerability assessment and planned activities with local emergency management, public health, and public safety officials.
- Determine major problems in the school with regard to responding to an incident (including student crime and violence).

- Assess how the school addresses these problems.
- Conduct an assessment to determine how these problems—as well as others—may impact vulnerability to certain crises.

## Preparedness Phase

### 2007 Recommendations:

- Determine what emergency preparedness/crisis plans exist in the district, school, and community.
- Identify all stakeholders involved in crisis planning.
- Develop procedures and conduct training and education of staff, students, and families on the emergency response protocols the school will implement during an emergency.
- Develop procedures for communicating with staff, students, families, and the media.
- Establish procedures to account for students during a crisis and assure reuniting students with parents.
- Gather information about the school facility, such as maps and the location of utility shutoffs.
- Identify the necessary equipment that needs to be assembled to assist staff in a crisis and ensure the equipment is stockpiled as needed.
- Develop a comprehensive evacuation plan for each school and if needed the entire local school system which accounts for all factors including supervision, accounting for all students and staff, reunification with parents, adequate transportation resources and multiple destination locations.
- Conduct drills and exercises that involve the school and partners in emergency management, public health, and public safety to evaluate preparedness.

## Response Phase

### 2007 Recommendations:

- Determine if a crisis is occurring.
- Identify the type of crisis that is occurring and determine the appropriate response.
- Activate the incident management system and coordinate response with local emergency management, public health, and public safety officials per established protocols.
- Ascertain whether an evacuation, reverse evacuation, lockdown, or shelter-in-place needs to be implemented.
- Maintain communication among all relevant staff at officially designated locations.
- Establish what information needs to be communicated to staff, students, families, and the community.



- Monitor how emergency first aid is being administered to those injured.
- Decide if more equipment and supplies are needed.

## Recovery Phase

### 2007 Recommendations:

- Strive to return the school to a normal learning environment as quickly as possible.
- Restore the physical plant, as well as the school community.
- Monitor how staff is assessing students for the emotional impact of the crisis.
- Identify what follow-up interventions are available to students, staff, and first responders.
- Assess curricular activities that address the crisis.
- Allocate appropriate time for recovery.
- Plan how anniversaries of events will be commemorated.
- Capture “lessons learned” and incorporate them into revisions and trainings as part of mitigation.

*[Editor's note: A special emphasis on preparedness is required for any children with special healthcare needs (CSHCN) that are in the school environment. Specific, dedicated plans should be developed in conjunction with the school, the caregivers, and the child's medical home for sheltering, evacuating, caring for, and reuniting CSHCN. An excellent reference for the continued medical care of CSHCN was developed by the American Academy of Pediatrics and the American College of Emergency Physicians is available for download at: <http://pediatrics.aappublications.org/cgi/content/full/104/4/e53>]*

## TRAINING AND DRILLS

For any system of preparedness to be functional, staff and communities must be trained. This training must then be evaluated and improved through drills and simulations.

The following recommendations address the needs of children in training and drills.

### Chemical, Biological, Radiological, Nuclear and Explosive Events (CBRNE)

#### 2007 Recommendations:

- Fund the collaborative development of a pediatric curriculum for all provider levels to increase the knowledge and skills needed to deal with a hazardous materials or CBRNE event. Funding should be explored with the CDC, the Department of Homeland Security, and other federal agencies.
- Develop the curriculum in a modular format, so that it can be easily included in existing programs and operational procedures and will be relevant to the specialties and level of care to be provided.
- Encourage all appropriate bodies to consider including the curriculum (once established) in their certifying processes, standard curricula, and continuing education programs.

### Disaster Training Programs

#### 2007 Recommendations:

- Include training on the assessment and care of children and in the usage of pediatric equipment commensurate with the practice levels of the participants in all disaster medical training programs. These programs should highlight the unique psychological, developmental, and physiological concerns of children and their unique vulnerabilities.
- Include pediatric issues relevant to each topic in the standard training provided to members of the NDMS.
- Provide federal funding to develop, coordinate, and disseminate standard educational goals and objectives for all levels of disaster responders regarding the assessment and care of children and families.
- Promulgate federal disaster policy and protocols to promote standardized disaster training objectives specific to children and families.
- Make pediatric disaster-related education available to supplemental response groups including, but not limited to, school staff, daycare personnel, community response organizations, civic organizations, specialty medical services, family practices, hospices, youth organizations, etc.
- Include multidisciplinary expertise in pediatrics at all stages of policymaking as well as course and curriculum development.
- Integrate disaster training programs with local operations and planning services throughout the design, implementation, and oversight phases for disaster management.

- Include pediatric disaster and terrorism education as part of the program requirements for residency education in pediatrics, emergency medicine, pediatric emergency medicine, and family practice.

## **Disaster Simulations and Drills**

### **2007 Recommendations:**

- Include sufficient proportions of pediatric victims and child-related scenarios in all regional disaster drills, and actively involve the major pediatric care providers within the community (e.g., children's hospitals, pediatric societies, day care centers, schools, etc). Such drills should also address the needs of children with special health care needs and children with mental health emergencies.
- Conduct drills with federal, state, and regional/local emergency managers that include exclusively pediatric victims or a majority of pediatric victims in various circumstances (e.g., in schools, day care facilities, school buses, etc) to adequately test the capacity of the system to handle pediatric patients.
- Develop educational adjuncts, including simulation software, for disaster and terrorism planning that accounts for events with pediatric patients in proportion to their existence in the population and for events that disproportionately affect children. However, these should not supplant physical pediatric disaster drills or the regional planning efforts necessary to stage them. Such adjuncts should address the variety of ages, developmental levels, and sizes of children who would require care during a disaster or terrorist event, as well as children with special health care needs and children with mental health emergencies.
- Facilitate the development of a model pediatric disaster drill template and related best practices by the federal EMSC program in partnership with other federal agencies. In addition, foster the creation of technical assistance teams to help regions conduct pediatric disaster drills in their areas. Such model drill templates and best practices must address the mental health needs of participants and actors before, during, and after pediatric disaster drills.
- Promote the standardization of pediatric disaster-related vocabulary with respect to incident command structures and field triage tools.

## FUTURE RESEARCH AGENDA AND FUNDING

The preceding recommendations have attempted to address a wide range of children's needs. These recommendations have largely been based on expert opinion in the absence of a large body of pediatric research. Improving our ability to meet the needs of children in the future will require further research in all areas.

The following recommendations address a proposed research agenda and description of funding needs for terrorism and disaster preparedness efforts for children.

### Epidemiology and Population-Based Studies

#### 2007 Recommendations:

- Develop and promulgate research and statistical models to allow the study of children in disasters and terrorist events and to evaluate their unique vulnerabilities.
- Fund research for pediatric-specific studies of national and international disaster, terrorist, and war events. These should include, but not be limited to, the following: 1) basic demographics, 2) epidemiology, 3) surveillance, 4) population density, 5) local health care providers, institutions, and other health resources (both fixed and mobile), 6) retrospective studies, 7) simulation models, and 8) telemedicine.
- Require equivalent and separate pediatric data collection in all federal, state, and regional/local disaster and terrorism programs funded by grants that require assessment or data submission by recipients. Examples of such grants include bioterrorism funding of state and local health departments and hospital preparedness funding from the Health Resources Services Administration and the CDC.

### Pediatric Triage and Prehospital Care

#### 2007 Recommendations:

- Include adequate data points to allow for collection of pediatric-specific data in prehospital data collection tools.
- Share prehospital and hospital data (within the constraints of patient confidentiality and privacy regulations) to facilitate research. The federal medical response teams must also share data using an adequate standardized data collection form.
- Appoint a federal agency to act as a clearinghouse for pediatric disaster data.
- Use clearly defined and standardized terms in pediatric disaster research, especially with regard to age groups and categorization (i.e., infant, toddler, child, etc).
- Perform descriptive studies of disaster threats and incidents to establish the state of our medical response systems, including capabilities to provide adequate care of children and their families during disasters.
- Conduct descriptive epidemiology studies of immediate and delayed effects before, during, and

after disasters of all types including mental health effects.

- Compare disaster preparedness of different categories of emergency field responders.
- Validate and analyze disaster triage and triage tools (i.e., patient distribution in relation to patient outcome).

## Natural Disasters

### 2007 Recommendations:

- Review existing federal, state, and regional/local plans for the management of natural disasters to ensure that the unique needs of children are met.
- Base plans for the management of natural disasters on an organized study of the injury and illness patterns of children in disasters from the best available data.
- Fund the development of a national uniformed disaster impact data set that includes planning for the care of children.
- Develop a methodology to assess/critique experience with disaster teams.
- Support the development of neighborhood disaster committees.

## Terrorism

### 2007 Recommendations:

- Require that all new pharmaceutical and therapeutic testing include evaluation of applicability and dosing for children.
- Require that all existing antibiotics and antidotes be tested for their applicability to children and determine pediatric dosing. Develop delivery methods for these agents that are pediatric-specific, including liquid preparations and mechanisms for weight-based dosing.
- Develop improved drug administration techniques for mass casualty incidents involving children.
- Include children in future studies of new vaccines for anthrax and smallpox and of a multivalent botulism immunoglobulin; in all new antibiotic, vaccine, and immunotherapy development; and in licensure of new nerve agent and other chemical agent antidote kits. These should include use during terrorist incidents; development of optimal dosing schedules for currently available drugs, and pursuing WMD indications for currently licensed medications.
- Include pediatric-specific models in research into optimal preventive and antidotal treatment and supportive care for all cases of WMD.
- Fund research through the National Institutes of Health (NIH) to address the differences in effects of biological, chemical, and radiological agents on children based on their unique anatomy and physiology.
- Require that all new research grant programs funded by NIH (including all its institutes), other federal agencies, and state and local agencies to study, biological, chemical, and radiological terrorism include research into pediatric effects of these agents and treatments.

- Advocate for long-term epidemiologic research, including addressing the needs of children, in WMD.
- Further evaluate optimal decontamination strategies for children.
- Encourage a pediatric component be added to Project Bio-Shield and advocate its passage on Capitol Hill.
- Assess responder safety during different types of WMD and disaster events by federal and state environmental, health, and occupational safety agencies.
- Assess true efficacy of field treatment of children in response to actual biological, chemical, or radiological events.

## **Mental Health and Psychosocial Needs of Children**

### **2007 Recommendations:**

- Seek multi-agency involvement (including NIH and its institutes) and other federal or local funding opportunities.
- Requests for Assistance (RFA) for research on resilience factors, specifically those related to disasters and pediatric post-traumatic stress responses, including grief, anxiety, depression, and physical and behavioral responses. Emphasize the integration of research findings into rapid response efforts.
- Develop models for rapid dissemination of post-disaster pediatric research findings and treatment outcome studies. Rapidly disseminating these findings to practice communities will allow for these treatment strategies to be incorporated into existing protocols as soon as possible.
- Provide RFAs to support research on testing and evaluating all intervention methodologies used in post-disaster settings. A priority for using treatments with limited prior research will be allowed so that effective interventions can be identified and disseminated.
- Provide RFAs for public mental health research on preparation and dissemination of disaster-related messages and warnings. We hope that these messages and warnings will reduce anxiety and adjustment reactions to disaster and will also enable us to better understand the role of media effects on the post-traumatic responses of children and families.
- Form a consensus panel to establish ethical guidelines for post-disaster mental health research for children and families.
- Provide RFAs to support research on building resilience in children and families. In addition, it is important that we obtain a better understanding of protective factors in the underserved and cultural minority populations.
- Provide academic institutions with the possibility of expedited IRB study review so that research protocols can begin shortly after disasters. Results of these studies can be used to inform public policy, funding needs, best treatment practices, and future research needs.

# ABOUT THE FIRST AND SECOND CONFERENCES

## **2003 Conference Structure (Published 2003)**

For three days, nearly seventy experts from across the nation gathered for an unprecedented discussion of the particular vulnerabilities of children to terrorist attacks or disasters and the possible responses. Topics were reviewed and approved by our advisory board and subject experts, using a modified Delphi method involving multiple questionnaires that has been well described in the literature. The meeting was conducted according to the following format: 1) presentations were given by experts on the subject areas to be addressed, 2) breakout groups were formed for focused discussion on topics within each subject area, and 3) the entire group met again to review each breakout group's conclusions and to develop a formal consensus recommendation. The concept behind the format was to gather baseline information, followed by a small group discussion and then a large group discussion to reach conclusions. All sessions focused on presentation and review of existing data for the subject being discussed, followed by development of consensus recommendations based on the data and/or expert opinion and a research agenda to advance the current knowledge base.

There was strong agreement that disaster planning based solely on the needs and requirements of adults would neither serve children nor sufficiently protect them in the event of a wide-scale terrorist attack. Even preparedness planning for adults is moving slowly in an environment increasingly likely to experience further attacks. In a series of discussions and surveys, the expert panel approved a number of critical recommendations and guidelines, which are summarized in this executive summary

## **2005 Conference Structure (Published 2007)**

The format of the 2005 conference followed the 2003 structure (see above). For 1-½ days, over eighty experts from across the nation gathered for another unprecedented discussion of the particular vulnerabilities of children to terrorist attacks or disasters and the possible responses. The topics included review of the 2003 guidelines and additional topics felt to be ones for which there was new literature or that were thought in 2003 to need further attention in a future meeting, or that have been identified nationally as a crucial preparedness topic. The new topics were reviewed and approved by our advisory board and subject experts using a modified Delphi method (as in 2003). Also as in 2003, the meeting was conducted with presentations being given by experts on the subject areas, discussion by small breakout groups, and further discussion for review of conclusions and development of a formal consensus recommendation by the entire group.

## Participant Backgrounds

Conference participants represented a cross-section of those with expertise, responsibility, and authority to make decisions involving pediatric preparedness for disaster and terrorist events. Participants had expertise and knowledge of the effects of biological, chemical, and radiological terrorism on children, as well as of the psychological stress faced by children and families. Participants included representatives of relevant professional organizations; representatives of multiple federal, state, and local government agencies involved with disaster and terrorism preparedness; experts in the fields of emergency medicine, pediatrics and its subspecialties, pediatric disaster medicine, nursing, social work, mental health, and emergency management; and individuals with recognized national expertise in relevant subject areas.



# PRIORITY ISSUES

## The 2009 Most Wanted List

The following two pages are a summary of the most wanted improvements in pediatric disaster preparedness that were either discussed by the panel or the editors. It may be useful for both education and advocacy.



## GENERAL PREPAREDNESS ISSUES, CONT'D

- Immediately establish and approve a formal recovery strategy that will address the urgent housing, mental health, medical, and educational needs of children still affected by Hurricane Katrina in 2009
- Ensure that all federally-funded medical and mental health disaster response teams have adequate pediatric expertise and equipment deployed with every response
- Implement the findings from recent consensus-based meetings regarding pediatric reunification after a disaster
- Develop consensus-based recommendations for the safe sheltering of children affected by disaster

## THE NATIONAL CENTER FOR DISASTER PREPAREDNESS

The NCDP, located at Columbia University's Mailman School of Public Health, is an academically-based resource center dedicated to the study, analysis, and enhancement of the nation's ability to respond to disasters and terrorism. Founded in 2003 by Irwin Redlener, MD the NCDP engages the public health workforce and communities in preparing for catastrophic events. The NCDP encompasses a CDC-funded Center for Public Health Preparedness.

The recommendations in this report are the summarized product of a series of three consensus meetings held in 2003, 2005, and 2009 with a diverse group of pediatric disaster medicine stakeholders and subject matter experts in academia, government, and from nonprofit organizations.

[www.ncdp.mailman.columbia.edu](http://www.ncdp.mailman.columbia.edu)

# 2009 Most Wanted List

## Pediatric Disaster Preparedness Improvements

National Center for Disaster Preparedness







Columbia University  
MAILMAN SCHOOL  
OF PUBLIC HEALTH

# 2009 NCDP Most Wanted List

# Pediatric Disaster Preparedness










## BIOLOGICAL AND CHEMICAL THREATS

-  Create a standing expert advisory group, drawn from stakeholder pediatric-related agencies and organizations, to maintain continuously updated recommendations on medical countermeasures to all known threats
-  Using the same group, establish the capability to rapidly develop consensus on pediatric medical countermeasure treatments for new or emerging threats in the future
-  Utilize the FDA's Emergency Use Authorization (EUA) mechanism to pre-approve pediatric medical countermeasures for the highest risk biological agents
-  Develop standardized training that is evidence-informed and competency-driven for pediatric patients exposed to CBRNE (chemical/biological/radiological/nuclear/explosive) threats
-  Fund and facilitate specific research into the treatment options for children exposed to CBRNE threats
-  Ensure that the Strategic National Stockpile contains an appropriate amount of pediatric-specific therapies, formulations, and equipment based on a child-focused assessment of risks and vulnerabilities using modeling
-  Ensure that children have parity with adults regarding access to community-based medical countermeasures available by EMS or in the hospital

### Status of Progress on Issue:

-  **Needs Immediate Attention**
-  **Further Significant Action Required**
-  **Progressing Well**

## GENERAL PREPAREDNESS ISSUES

-  Ensure that any disaster or emergency planning that occurs using federal funds addresses the needs of all children in the community as a pre- and post- condition of award payment
-  Empower local, regional, and state level public health agencies with adequate funding and resources to better partner with the federal government to deliver comprehensive services for children during and after a disaster
-  The federal government and pediatric stakeholders should establish one unified, credible source for continuously updated pediatric medical and public health information during a disaster to avoid mixed messages
-  Using an evidence-informed process, develop realistic target deliverables to guide the planning for a pediatric surge in prehospital, medical, and mental health needs
-  Develop a national pediatric triage standard that assures the interoperability of responders to a multi-jurisdictional disaster involving children
-  Establish a task force to conduct a national-level after action review of the novel H1N1 outbreak specific to identifying gaps in the care of children
-  Create a single-source repository that contains all available research and best practices information on the topic of children and disaster, and is continually updated and easy to access
-  Establish an directorate in the White House with broad oversight on the issue of children's affairs, including the issue of disaster preparedness, response, and recovery
-  Promote the role of children's hospitals as regional centers of excellence and resources for pediatric disaster preparedness, response, and recovery issues





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