



# Pediatric Preparedness for Disasters and Terrorism

National Consensus Conference



National Center for  
Disaster Preparedness

Mailman School of Public Health  
Columbia University

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

A National Consensus Conference

*Executive Summary and Final Report*

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## OVERVIEW

In 2003, we convened experts from the multiple areas of expertise and disciplines involved in the planning for and care of children during times of disaster and terrorist events. The goals of this unprecedented meeting were to:

- Build collaboration among individuals with expertise in emergency management, including disaster medicine, disaster planning, pediatric emergency medicine, pediatric critical care, pediatric surgery, and emergency management, management, and response.
- Review and summarize the existing data on the needs of children in disasters, including planning, preparation, and response.
- Develop consensus on the needs of persons with disabilities in disasters.
- Create a research agenda to address knowledge gaps based on the limited data that exist on the needs of children in disasters.

The 2003 conference led to the pediatric consensus document that established the first national guidelines and recommendations for pediatric preparedness. These guidelines then served to advance pediatric preparedness by allowing all those involved in emergency preparedness, including emergency management, public health, law enforcement, fire service, EMS, and hospital systems, to begin preparing to deal with children in disaster situations. These guidelines also served as the basis for discussion by the National Advisory Committee on Children and Terrorism.

In December 2005, we reconvened our experts to begin the process of updating and amending the guidelines to reflect advances in scientific and empirical knowledge since the 2003 conference. This document is the result of a second national consensus conference on addressing pediatric needs in emergency preparedness and response. All contents were discussed and updated; however, particular attention was paid to areas that have advanced since 2003. School preparedness, pediatric hospital care, pediatric treatment and management of biological, chemical and radiologic terrorism, and pediatric mental health all have substantially new or updated recommendations.

## INTRODUCTION

A disaster is an event that destroys property, causes injury or loss of life, or affects a large population or area. In planning responses to natural disasters, terrorism or public health emergencies, important aspects to be considered are the type of hazard, the extent of damage, useable and available resources, and the size and nature of the population involved. Historically, most aspects of planning have considered only the needs of adults. Children with special health care needs are particularly vulnerable, even more so if their survival is dependent upon access to medical technology on a regular basis.

### Special Considerations in Emergency Preparedness for Children

Children have unique vulnerabilities to emergencies which must be accounted for in the planning for disasters, terrorism and public health emergencies. Examples of these differences include:

- 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 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 include the care of *all* members of the community in times of terrorist events. This includes planning for the needs of children in training and equipment, as well as considering individuals with disabilities. Importantly, emergency planners and responders cannot approach the care of children by simply scaling down or modifying current 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. Other federal agencies involved in disaster relief planning include the Department of Transportation, Department of Defense, Department of Housing and Urban Development, and Department of Health and Human Services. In addition to federal agencies, state and

local emergency management agencies have area-wide response plans. More recently, disaster response and recovery have also involved neighborhoods and families, and have even begun to address needs at the individual level. Volunteer organizations, such as the American Red Cross, also have key 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 by themselves, while identifying issues and providing suggestions, cannot ensure an organized response to pediatric disasters. They can be more useful if explicitly endorsed by local public health and safety authorities and if fully integrated into local disaster preparedness initiatives. Even so, these policies are often based on a “best advice” approach because of the lack of data. 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 continue to correct this deficiency, we must 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.

As part of the 2003 process, we conducted a literature review to determine what data currently exist on the specific needs of persons with disabilities in disasters. Unfortunately, the literature is extremely limited, providing scant guidance on pediatric disaster preparedness. In addition to this, through our discussions with representatives of many states, municipalities, and professional organizations, we found that there continues to be an immediate need for direction on the needs of children in disaster and terrorism planning and response. In 2005, we again conducted a literature review and, while some new data were available, overall the information available regarding pediatric preparedness is still very limited.

### **2003 Conference Structure**

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 key recommendations and guidelines, which are outlined in this executive summary.

## **2005 Conference Structure**

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 key 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.

## **Acknowledgements**

The conference chairs would like to thank the many individuals whose work has led to this document. We would first like to thank our group leaders, who helped us identify and develop the key issues in emergency preparedness for persons with disabilities. Much of this document is due to their expertise. Elizabeth Fuller was essential in conference organization and planning. Her hard work insured that the conference was well organized and productive. We would also like to thank the speakers, who set the stage for the discussion, and the participants, who actively engaged in debate and brainstorming. (For a complete list of participants,

see page10). We would also like to thank the Agency for Healthcare Research and Quality (AHRQ) and the Emergency Medical Services for Children (EMSC) Program of the Maternal and Child Health Bureau (MCHB), Health Resources and Services Administration (HRSA) of the Department of Health and Human Services, for providing the financial support for the meeting. We appreciate the constant support and advice received from Sally Phillips, whose efforts made both the first and this second conference a reality. We also thank David Heppel, MD, and Dan Kavanaugh, MSW, of the MCHB, HRSA, for their direction and assistance with this project and with the meeting. We would also like to thank our copy editor Susan E. Aiello, DVM, ELS, for her exemplary and tireless efforts that were essential to the creation of this document. The authors would also like to thank the staff of The National Center for Disaster Preparedness, The Program for Pediatric Preparedness, and The Children's Health Fund, whose help in the logistics of organizing the conference and on-site support of the meeting and group discussions were invaluable.

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## THE RECOMMENDATIONS

The specific recommendations can be found in the following sections listed below.

1. Emergency and Prehospital Care
2. Hospital Care
3. Preparedness and Response
4. Biological, Chemical and Radiologic Terrorism Treatment
5. Decontamination, Quarantine and Isolation
6. Mental Health Needs
7. School Preparedness and Response
8. Training and Drills
9. Future Research Agenda and Funding

### Priority Recommendations

While all recommendations and guidelines developed at the consensus meeting and as part of this evidence based consensus process were felt to be critical to ensure the minimum disaster, terrorism and public health emergency preparedness for children, it was felt that certain recommendations should be of the utmost priority and should be implemented immediately. These priority recommendations are listed throughout the recommendation sections which follow in this document and are indicated in bold.

## 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 they need, while appropriately allocating scarce resources during disaster and terrorist events. Therefore, 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

- 1.1 **Incorporate use of a pediatric-specific triage system by all first responders and hospital personnel. This will provide guidance for triage personnel making potential life and death decisions that otherwise may be influenced by emotional issues when triaging children.**
- 1.2 Designate a pediatric-specific triage process for use in training by first responders and emergency personnel.
- 1.3 Continue to develop, improve, and implement triage systems that are objective and child-specific to advance the efficiency and accuracy of triage.
- 1.4 Ensure integration and consistency of use of pediatric triage processes among local, state, and federal responders, including Disaster Medical Assistance Teams (DMATs).
- 1.5 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.
- 1.6 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

- 1.7 Equip emergency medical services (EMS) personnel and response vehicles with pediatric-specific equipment and medications if that treatment capacity exists for adults. This includes supplies for decontamination and assessment/treatment for biological, chemical, and radiological terrorism.
- 1.8 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).
- 1.9 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.

## HOSPITAL CARE

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. In addition, hospitals are a key resource of trained staff that may be needed in times of emergency or by other facilities, or both.

All 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 a greater number of pediatric victims than usual. In addition to their general importance, specialty centers must also be prepared for increased pediatric needs. Staff and physician volunteer programs, which are key 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

- 2.1 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.**
- 2.2 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.**
- 2.3 Include a detailed pediatric component in Web-based hospital resource availability networks.**
- 2.4 The National Bioterrorism Hospital Preparedness Program and any other federal funding to states must include pediatric specific objective and measurable objectives.
- 2.5 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.
- 2.6 Develop informational resources and training for pediatric-specific responses to biological, chemical, and radiological terrorism.
- 2.7 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.
- 2.8 Ensure that all agents and equipment that are stocked for natural disasters, terrorism and public health emergencies are either specifically designed and approved for pediatric use or can be appropriately substituted for pediatric use.
  - 2.9 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**

- 2.11 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.
- 2.12 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.
- 2.13 Promote communication and consultation between facilities by availability of multiple horizontal communication systems that include patient records and medical information.
- 2.14 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.
- 2.15 Develop multiple systems capable of transporting pediatric patients of varying medical needs and acuity to link pediatric patient care resources.

## PREPAREDNESS AND RESPONSE

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; therefore, 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 then direct these resources to 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.

### Emergency Planning

- 3.1 **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.**
- 3.2 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

- 3.3 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.
- 3.4 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)

- 3.5 **Require that there be care providers who have specific pediatric training for all deployments, including on specialty teams.**
- 3.6 **Include adequate supplies of pediatric equipment and pharmaceuticals in all NDMS basic loads supplied to DMATs.**
- 3.7 Integrate the unique needs of children (and families), including their mental health, in all training and drill programs sponsored by NDMS.
- 3.8 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.

- 3.9 Ensure availability of pediatric response resources within NDMS, incorporating pediatric specialty teams or pediatric-trained members.

### **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:

- 3.10 Prepare, regularly update, and practice an office disaster plan.**
- 3.11 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]).**
- 3.12 Be educated in issues of pediatric disaster management, including biological, chemical, and radiological events.
- 3.13 Assist in developing a hospital disaster plan that ensures the proper care of children.
- 3.14 Be involved in EMS (e.g., be proficient in CPR and first aid).
- 3.15 Know liability and licensure issues in providing care during and after disasters.
- 3.16 Participate in state and regional/local community response team planning.
- 3.17 Participate in state Health Alert Network/Communications and Information Technology.
- 3.18 Anticipate and prepare for loss of community services.
- 3.19 Aid schools and child care facilities in developing disaster plans.
- 3.20 Provide guidance to families of children with special health care needs.
- 3.21 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.
- 3.22 Advocate for inclusion of the needs of children in all federal, state, and regional/local disaster planning.
- 3.23 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**

- 3.24 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.
- 3.25 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.
- 3.26 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)**

3.27 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:

- 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

- 3.28 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.**
- 3.29 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.**
- 3.30 Facilitate prompt communication among family members in community disaster plans.**
- 3.31 Develop evacuation plans that allow for contacting and reuniting children with their families.**
- 3.32 Consider development of a single-point information collection system to facilitate contacting and reuniting families in community disaster plans.
- 3.33 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 specific to a terrorist event must be considered. Addressing the needs of children is especially important in terrorism preparedness and response because 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

#### AGENT AVAILABILITY

- 4.1 All bioterrorism medication provision plans should call for all agents listed in Tables 2 and 3 being kept in appropriate dosages and forms for children. This would include the Strategic National Stockpile (SNS) (12-Hour Push Packs and Managed Inventory), state and local health department stocking and deployment of these agents in local responder and chemical terrorism treatment provisions.

#### CHEMOTHERAPY AND CHEMOPROPHYLAXIS

- 4.2 Chemotherapy and chemoprophylaxis protocols should be based on the recommendations in Tables 2 and 3.

#### IMMUNOTHERAPY AND IMMUNOPROPHYLAXIS

- 4.3 Include provisions for study and/or use in children in any new investigational vaccine studies.
  - 4.3a **Anthrax:** The currently licensed vaccine (Biothrax<sup>®</sup>, Bioport Corporation) is approved for persons 18-65 years old. 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.
  - 4.3b **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.*
  - 4.3c **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.*

- 4.3d Plague: No licensed plague vaccine is currently in production.** A previously licensed vaccine was approved only for persons 18-61 years old. *There is little, if any, role for this or similar vaccines in a bioterrorist context.*

## **Physical Protection**

- 4.4 Under most circumstances, there is little role for physical protection against bioterrorist 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. For example, reports exist of Israeli children suffocating after donning gas masks during Operation Desert Storm.
- 4.5 Research into future means of physical protection must consider the needs of children.

**Table 2. Recommended Therapy and Prophylaxis of Anthrax in Children**

FORM OF ANTHRAX	CATEGORY OF TREATMENT (THERAPY OR PROPHYLAXIS)	AGENT AND DOSAGE
Inhalation	Therapy <sup>a</sup>	Ciprofloxacin <sup>b</sup> 10-15 mg/kg IV q12h (max 400 mg/dose) <b>or</b> Levofloxacin 10-15 mg/kg IV q24h <b>or</b> Doxycycline 2.2 mg/kg IV (max 100mg) q12h <b>and</b> Clindamycin <sup>c</sup> 10-15 mg/kg IV q8h <b>and</b> Penicillin G <sup>e</sup> 400-600k u/kg/d IV divided q4h  Patients who are clinically stable after 14 days can be switched to a single oral agent (ciprofloxacin or doxycycline) to complete a 60-day course <sup>d</sup> of therapy.
Inhalation	Postexposure prophylaxis (60-day course <sup>d</sup> )	Ciprofloxacin <sup>f</sup> 10-15 mg/kg PO (max 500 mg/dose) q12h <b>or</b> Levofloxacin 10-15 mg/kg IV q24h <b>or</b> Doxycycline 2.2 mg/kg (max 100mg) PO q12h
Cutaneous, endemic	Therapy <sup>g</sup>	Penicillin V 40-80 mg/kg/d PO divided q6h <b>or</b> Amoxicillin 40-80 mg/kg/d PO divided q8h <b>or</b> Ciprofloxacin 10-15 mg/kg PO (max 1 gm/day) q12h <b>or</b> Levofloxacin 10-15 mg/kg IV q24h <b>or</b> Doxycycline 2.2 mg/kg PO (max 100 mg) q12h
Cutaneous (in setting of terrorism)	Therapy <sup>a</sup>	Ciprofloxacin 10-15 mg/kg PO (max 1 gm/day) q12h <b>or</b> Levofloxacin 10-15 mg/kg IV q24h Doxycycline 2.2 mg/kg PO (max 100 mg) q12h
Gastrointestinal	Therapy <sup>a</sup>	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>a</sup> In a mass casualty setting, in which resources are severely limited, oral therapy may need to be substituted for the preferred parenteral option.

<sup>b</sup> Ofloxacin (and possibly other quinolones) may be acceptable alternatives to ciprofloxacin or levofloxacin

<sup>c</sup> Rifampin or clarithromycin may be acceptable alternatives to clindamycin as drugs that target bacterial protein synthesis.

<sup>d</sup> Upon confirmation of antibiotic sensitivities, infants and children may be switched to oral amoxicillin (40-80 mg/kg/d divided q8h) to complete a 60-day course. We recommend, however, that the first 14 days of either therapy or prophylaxis be conducted with the agents listed above, regardless of sensitivities, prior to making this change

<sup>e</sup> Ampicillin, imipenem, meropenem, or chloramphenicol may be acceptable alternatives to penicillin as drugs with good CNS penetration.

<sup>f</sup> According to most experts, ciprofloxacin is the preferred agent for oral prophylaxis.

<sup>g</sup> Ten days of therapy may be adequate for endemic cutaneous disease. If the mechanism of exposure is unknown, strongly consider a full 60 day course due to the possibility of concomitant inhalational exposure, especially in children.

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

DISEASE	THERAPY OR PROPHYLAXIS	TREATMENT <sup>a</sup> , AGENT, AND DOSAGE
Smallpox	Therapy	Supportive care
	Prophylaxis	Vaccination may be effective if given within the first several days after exposure.
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 <sup>b</sup> 15 mg/kg IV q12h <b>or</b> Levofloxacin 10-15 mg/kg IV q24h <b>or</b> Chloramphenicol <sup>c</sup> 25m/kg 6qh (max 4 gm/day)
	Prophylaxis	Doxycycline 2.2 mg/kg PO q12h <b>or</b> Ciprofloxacin <sup>b</sup> 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 <sup>d</sup>
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 x 5

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

<sup>a</sup> In a mass casualty setting, parenteral therapy might not be possible. In such cases, oral therapy (with analogous agents) may need to be used.

<sup>b</sup> Ofloxacin (and possibly other quinolones) may be acceptable alternatives to ciprofloxacin or levofloxacin; however, they are not approved for use in children.

<sup>c</sup> Concentration should be maintained between 5 and 20 mcg/mL. Some experts have recommended that chloramphenicol be used to treat patients with plague meningitis, because chloramphenicol penetrates the blood-brain barrier. Use in children younger than 2 may be associated with adverse reactions but might be warranted for serious infections.

<sup>d</sup> Ribavirin is recommended for arenavirus or bunyavirus infections, and may be indicated for a viral hemorrhagic fever of an unknown etiology although not FDA approved for these indications. For intravenous therapy use a loading dose: 30 kg IV once (max dose, 2 gm), then 16 mg/kg IV q6hr for 4 days (max dose, 1 gm) and then 8 mg/kg IV q8hr for 6 days (max dose, 500 mg). In a mass casualty setting, it may be necessary to use oral therapy. For oral therapy, use a loading dose of 30 mg/kg PO once, then 15 mg/kg/day PO in 2 divided doses for 10 days.

<sup>e</sup> For children younger than 8 years. For children older than 8 years, adult regimens are recommended. Oral drugs should be given for 6 wk. Gentamicin, if used, should be given for the first 5 days of a 6-wk course of TMP/SMX (trimethoprim/sulfamethoxazole).

## Chemical Terrorism

- 4.5 **Use Mark-1 Autoinjector kits or DuoDote, which has begun to replace the Mark-1, although not approved for pediatric use, as initial treatment in circumstances for children with severe, life-threatening nerve agent toxicity for whom IV treatment is not possible or available or for whom more precise IM (mg/kg) dosing would be logistically impossible.**
- 4.6 **Expedite approval of a pediatric auto injector kit containing both atropine and pralidoxime.**
- 4.7 **Keep all agents listed in Table 4 available and in appropriate dosage and forms for children in all chemical terrorism medication provision plans. This would include the SNS, 12-Hour Push Packages, state and local health department stocking and deployment of these agents in local responder and chemical terrorism treatment provisions.**
- 4.8 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).
- 4.9 Provide educational programs on possible chemical terrorism for EMS and community health care workers (e.g., school nurses) and provide for ongoing training and assessment.
- 4.10 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.
- 4.11 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.
- 4.12 Keep adequate stocks of antidotes, especially those for nerve agents, available for use by EMS and hospital emergency departments. The numbers of stock items should be based on risk assessment to determine the numbers of all possibly exposed children and those children being transported for treatment. The SNS must include adequate provisions for pediatric dosing and administration of antidotes.
- 4.13 Immediately foster the development and approval of pediatric equivalent autoinjectors for all existing and to be developed chemical antidote autoinjectors.
- 4.14 Ensure that EMS and emergency departments have protocols for rapid delivery of critical nerve agent antidotes and for use of the current Mark-1 or DuoDote autoinjector in children.
- 4.15 Make cyanide antidotes, with clear size-adjusted dosing regimens, widely available.
- 4.16 Strongly consider developing a universal, size-adjusted dosing system (such as the Luten-Broselow color coding paradigm) for cyanide antidotes and other critical care medications that require IV administration.
- 4.17 Fund the AAP and/or other recognized authorities to develop a course covering pediatric consideration for CBRNE events. Support and provide for continuing assessment and drills.
- 4.18 Base treatment protocols for chemical terrorism on the recommendations in Tables 4 and 5.

**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	Anticholine sterase: muscarinic, nicotinic, and CNS effects	Vapor: miosis, rhinorrhea, dyspnea	Vapor: seconds	Vapor: fresh air, remove clothes, wash hair	ABCs Atropine <sup>b,c,d</sup> : 0.05 mg/kg IV, IM (min 0.1mg, max 5 mg), repeat q2-5 min prn for marked secretions, bronchospasm Pralidoxime <sup>e</sup> : 25 mg/kg IV, IM (max 1 g IV; 2 g IM), may repeat within 30-60 min prn, then again q1hr for 1 or 2 doses prn for persistent weakness, high atropine requirement Diazepam: 0.3 mg/kg (max 10 mg) IV; Lorazepam: 0.1 mg/kg IV, IM (max 4 mg); Midazolam: 0.2 mg/kg (max 10 mg) IM prn seizures, or severe exposure
		Liquid: Diaphoresis, Vomiting  Both: coma, paralysis, seizures, apnea	Liquid: minutes to hours	Liquid: remove clothes, copious washing of skin and hair with soap and water, ocular irrigation	
<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		



### Table 5. Autoinjector Usage

When using adult autoinjectors, appropriate atropine and pralidoxime dosing for children may be estimated as follows. If pediatric autoinjectors are available and it is operationally practical, the standard 2.0 mg atropine in a Mark-I kit may be replaced with a pediatric atropine autoinjector or the pediatric atropine autoinjector may be combined with a pralidoxime autoinjector. With this approach use the table below to determine the number of pralidoxime autoinjectors. This approach is not possible with DuoDote as this is provided as a single unit with both medications.

APPROXIMATE AGE	APPROXIMATE WEIGHT	NUMBER OF AUTOINJECTORS (EACH TYPE)	ATROPINE DOSAGE RANGE (MG/KG)	PRALIDOXIME DOSAGE RANGE (MG/KG)
3-7 yrs	13-25 kg	1	0.08-0.13	24-46
8-14 yrs	26-50 kg	2	0.08-0.13	24-46
>14 yrs	>51 kg	3	0.11 or less	35 or less

Each Mark-1 kit contains two autoinjectors (0.8 inch needle insertion depth), one each of atropine 2 mg (0.7 mL) and pralidoxime 600 mg (2 mL), to be administered in two separate intramuscular sites. DuoDote provides the same medications, atropine 2.1 mg (0.7 mL) and pralidoxime 600 mg (2 mL), but as a single Autoinjector with the need for only one intramuscular injection; while not approved for pediatric use, they should be used as initial treatment in circumstances for children with severe, life-threatening nerve agent toxicity for whom IV treatment is not possible or available or for whom more precise IM (mg/kg) dosing would be logistically impossible (especially pre-hospital). Suggested dosing guidelines are offered; note potential excess of initial atropine and pralidoxime dosage for age/weight, although within general guidelines for recommended total over first 60-90 min of therapy for severe exposures.

This table lists usage of the Mark-1 kit or DuoDote only down to age 3 based on adherence to recommended dosages for atropine and pralidoxime. However, if an adult Mark-1 kit or DuoDote is the only available source of atropine and pralidoxime after a bona fide nerve agent exposure, it should be administered to even the youngest child.

### Radiologic Terrorism

- 4.19 **Develop plans and distribution systems in all localities that provide for KI administration within 2 hr of exposure to radioactive iodine to ensure that all children who need KI can receive it. (KI is a valuable intervention for children exposed to radioiodines.)**  
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.
- 4.20 **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.**
- 4.21 **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  $\geq 5$  cGy projected internal thyroid exposure in children.**

- 4.22 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.*
- 4.23 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.
- 4.24 Increase the knowledge base among all pediatric care providers about medical and psychological aspects of radiation exposure.
- 4.25 Except as stated above, ensure that the dosing of KI conforms to Tables 6, 7, and 8.
- 4.26 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.
- 4.27 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.
- 4.28 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.
- 4.29 Prussian Blue (Radiogardase®) 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	
		mg	65 mg/mL solution
>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 (only solution available at the time of the conference was ThyroShield™).

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 (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 16.25 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 8.125 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> (Epoegen, 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

- 5.1 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.
- 5.2 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.
- 5.3 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.
- 5.4 Whenever operationally possible, provide isolation as a family unit.

### Strategic National Stockpile (SNS)

- 5.5 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.
- 5.6 Coordinate distribution of pediatric specific supplies, including SNS, in state and regional/local disaster plans.
- 5.7 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

- 6.1 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.
- 6.2 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.
- 6.3 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.
- 6.4 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.
- 6.5 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.
- 6.6 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.
- 6.7 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.

- 6.8 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.
- 6.9 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.
- 6.10 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.
- 6.11 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.
- 6.12 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.
- 6.13 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.
- 6.14 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.
- 6.15 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.
- 6.16 Ensure the understanding of resilience building in children and families as essential in preparedness

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

- 6.17 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.
- 6.18 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.
- 6.19 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.

- 6.20 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.
- 6.20 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).
- 6.21 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.
- 6.22 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.
- 6.23 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.
- 6.24 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 to 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, it is important that schools 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.

Because of their size, complexity, and unique sets of challenges, schools should also host and conduct internal tabletop exercises to ensure that school 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 key 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

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

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

### **Preparedness Phase**

- 7.10 Determine what emergency preparedness/crisis plans exist in the district, school, and community.
- 7.11 Identify all stakeholders involved in crisis planning.
- 7.12 Develop procedures and conduct training and education of staff, students, and families on the emergency response protocols the school will implement during an emergency.
- 7.13 Develop procedures for communicating with staff, students, families, and the media.
- 7.14 Establish procedures to account for students during a crisis and assure reuniting students with parents.
- 7.15 Gather information about the school facility, such as maps and the location of utility shutoffs.
- 7.16 Identify the necessary equipment that needs to be assembled to assist staff in a crisis and ensure the equipment is stockpiled as needed.
- 7.17 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.
- 7.18 Conduct drills and exercises that involve the school and partners in emergency management, public health, and public safety to evaluate preparedness.

### **Response Phase**

- 7.18 Determine if a crisis is occurring.
- 7.19 Identify the type of crisis that is occurring and determine the appropriate response.
- 7.20 Activate the incident management system and coordinate response with local emergency management, public health, and public safety officials per established protocols.
- 7.21 Ascertain whether an evacuation, reverse evacuation, lockdown, or shelter-in-place needs to be implemented.
- 7.22 Maintain communication among all relevant staff at officially designated locations.
- 7.23 Establish what information needs to be communicated to staff, students, families, and the community.
- 7.24 Monitor how emergency first aid is being administered to those injured.
- 7.25 Decide if more equipment and supplies are needed.

## Recovery Phase

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

## 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)

- 8.1 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.
- 8.2 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.
- 8.3 Encourage all appropriate bodies to consider including the curriculum (once established) in their certifying processes, standard curricula, and continuing education programs.

### Disaster Training Programs

- 8.4 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.
- 8.5 Include pediatric issues relevant to each topic in the standard training provided to members of the NDMS.
- 8.6 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.
- 8.7 Promulgate federal disaster policy and protocols to promote standardized disaster training objectives specific to children and families.
- 8.8 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.
- 8.9 Include multidisciplinary expertise in pediatrics at all stages of policymaking as well as course and curriculum development.
- 8.10 Integrate disaster training programs with local operations and planning services throughout the design, implementation, and oversight phases for disaster management.
- 8.11 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

- 8.12 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.
- 8.13 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.
- 8.14 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.
- 8.15 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.
- 8.16 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 these 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

- 9.1 Develop and promulgate research and statistical models to allow the study of children in disasters and terrorist events and to evaluate their unique vulnerabilities.
- 9.2 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.
- 9.3 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

- 9.4 Include adequate data points to allow for collection of pediatric-specific data in prehospital data collection tools.
- 9.5 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.
- 9.6 Appoint a federal agency to act as a clearinghouse for pediatric disaster data.
- 9.7 Use clearly defined and standardized terms in pediatric disaster research, especially with regard to age groups and categorization (i.e., infant, toddler, child, etc).
- 9.8 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.
- 9.9 Conduct descriptive epidemiology studies of immediate and delayed effects before, during, and after disasters of all types including mental health effects.
- 9.10 Compare disaster preparedness of different categories of emergency field responders.
- 9.11 Validate and analyze disaster triage and triage tools (i.e., patient distribution in relation to patient outcome).

## Natural Disasters

- 9.12 Review existing federal, state, and regional/local plans for the management of natural disasters to ensure that the unique needs of children are met.
- 9.13 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.
- 9.14 Fund the development of a national uniformed disaster impact data set that includes planning for the care of children.
- 9.15 Develop a methodology to assess/critique experience with disaster teams.
- 9.16 Support the development of neighborhood disaster committees.

## Terrorism

- 9.17 Require that all new pharmaceutical and therapeutic testing include evaluation of applicability and dosing for children.
- 9.18 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.
- 9.19 Develop improved drug administration techniques for mass casualty incidents involving children.
- 9.20 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.
- 9.21 Include pediatric-specific models in research into optimal preventive and antidotal treatment and supportive care for all cases of WMD.
- 9.22 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.
- 9.23 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.
- 9.24 Advocate for long-term epidemiologic research, including addressing the needs of children, in WMD.
- 9.25 Further evaluate optimal decontamination strategies for children.
- 9.26 Encourage a pediatric component be added to Project Bio-Shield and advocate its passage on Capitol Hill.
- 9.27 Assess responder safety during different types of WMD and disaster events by federal and state environmental, health, and occupational safety agencies.
- 9.28 Assess true efficacy of field treatment of children in response to actual biological, chemical, or radiological events.

## Mental Health and Psychosocial Needs of Children

- 9.29 Seek multi-agency involvement (including NIH and its institutes) and other federal or local funding opportunities.
- 9.30 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.
- 9.31 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.
- 9.32 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.
- 9.33 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.
- 9.34 Form a consensus group to establish ethical guidelines for post-disaster mental health research for children and families.
- 9.35 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.
- 9.36 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.

## CONCLUSION AND FUTURE DIRECTIONS

This conference and evidence based process represented a major step forward in the pediatric preparedness for natural disasters, terrorist events and public health emergencies, and resulted in a set of recommendations and guidelines to address the particular vulnerabilities of children to terrorist attacks or disasters and the possible responses.

The development of these recommendations and guidelines are only facet of improving disaster, terrorism and public health emergency preparedness for children. The next step is to ensure that these recommendations reach the individuals with the authority to make decisions regarding their adoption, as well as those who will be putting them into use. This will be accomplished by sending the information to the federal agencies with responsibility for disaster and terrorism preparedness, i.e., FEMA, Homeland Security, Department of Education, and Department of Health and Human Services, which includes the CDC, HRSA, Maternal and Child Health Bureau, Agency for Healthcare Research and Quality, SAMHSA, FDA, and the Office of Emergency Preparedness. This information will also be distributed to the state offices of emergency management, state departments of health, and state departments of EMS. These agencies will be encouraged and assisted in implementing these recommendations and guidelines and directed to forward the information to their counterparts in local government. Finally, the information will also be sent to congressional leaders who oversee the agencies that are responsible for preparedness and who can pass legislation to enable implementation of these recommendations and guidelines.

For the future, we need to enhance our knowledge base regarding children's needs. This will require funding of the research agenda by congress, the NIH, and other federal agencies responsible for preparedness. We plan to reconvene this panel in one year to evaluate the current implementation of the recommendations and guidelines, to update the recommendations as needed based on new research, and to plan the continuing research agenda.

## ABBREVIATIONS

AAP	American Academy of Pediatrics
CDC	Centers for Disease Control and Prevention
CSHCN	children with special health care needs
DMAT(s)	Disaster Medical Assistance Team(s)
EMS	emergency medical services
EMSC	Emergency Medical Services for Children
FDA	Food and Drug Administration
FEMA	Federal Emergency Management Agency
HRSA	Health Resources Services Administration
KI	potassium iodide
MCHB	Maternal and Child Health Bureau
NIH	National Institutes of Health
NDMS	National Disaster Medical System
NPS	National Pharmaceutical Stockpile
RFA	Request for Assistance
SAMHSA	Substance Abuse and Mental Health Services Administration
SNS	Strategic National Stockpile
WMD	weapons of mass destruction

## REFERENCE TABLES

**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

**Table 2. Recommended Therapy and Prophylaxis of Anthrax in Children**

FORM OF ANTHRAX	CATEGORY OF TREATMENT (THERAPY OR PROPHYLAXIS)	AGENT AND DOSAGE
Inhalation	Therapy <sup>a</sup>	Ciprofloxacin <sup>b</sup> 10-15 mg/kg IV q12h (max 400 mg/dose) <b>or</b> Levofloxacin 10-15 mg/kg IV q24h <b>or</b> Doxycycline 2.2 mg/kg IV (max 100mg) q12h <b>and</b> Clindamycin <sup>c</sup> 10-15 mg/kg IV q8h <b>and</b> Penicillin G <sup>e</sup> 400-600k u/kg/d IV divided q4h  Patients who are clinically stable after 14 days can be switched to a single oral agent (ciprofloxacin or doxycycline) to complete a 60-day course <sup>d</sup> of therapy.
Inhalation	Postexposure prophylaxis (60-day course <sup>d</sup> )	Ciprofloxacin <sup>f</sup> 10-15 mg/kg PO (max 500 mg/dose) q12h <b>or</b> Levofloxacin 10-15 mg/kg IV q24h <b>or</b> Doxycycline 2.2 mg/kg (max 100mg) PO q12h
Cutaneous, endemic	Therapy <sup>g</sup>	Penicillin V 40-80 mg/kg/d PO divided q6h <b>or</b> Amoxicillin 40-80 mg/kg/d PO divided q8h <b>or</b> Ciprofloxacin 10-15 mg/kg PO (max 1 gm/day) q12h <b>or</b> Levofloxacin 10-15 mg/kg IV q24h <b>or</b> Doxycycline 2.2 mg/kg PO (max 100 mg) q12h
Cutaneous (in setting of terrorism)	Therapy <sup>a</sup>	Ciprofloxacin 10-15 mg/kg PO (max 1 gm/day) q12h <b>or</b> Levofloxacin 10-15 mg/kg IV q24h Doxycycline 2.2 mg/kg PO (max 100 mg) q12h
Gastrointestinal	Therapy <sup>a</sup>	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>a</sup> In a mass casualty setting, in which resources are severely limited, oral therapy may need to be substituted for the preferred parenteral option.

<sup>b</sup> Ofloxacin (and possibly other quinolones) may be acceptable alternatives to ciprofloxacin or levofloxacin

<sup>c</sup> Rifampin or clarithromycin may be acceptable alternatives to clindamycin as drugs that target bacterial protein synthesis.

<sup>d</sup> Assuming the organism is sensitive, children may be switched to oral amoxicillin (40-80 mg/kg/d divided q8h) to complete a 60-day course. We recommend that the first 14 days of therapy or postexposure prophylaxis, however, include ciprofloxacin or levofloxacin and/or doxycycline regardless of age.

<sup>e</sup> Ampicillin, imipenem, meropenem, or chloramphenicol may be acceptable alternatives to penicillin as drugs with good CNS penetration.

<sup>f</sup> According to most experts, ciprofloxacin is the preferred agent for oral prophylaxis.

<sup>g</sup> Ten days of therapy may be adequate for endemic cutaneous disease. We recommend a full 60-day course in the setting of terrorism, however, because of the possibility of concomitant inhalational exposure.

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

DISEASE	THERAPY OR PROPHYLAXIS	TREATMENT <sup>a</sup> , AGENT, AND DOSAGE
Smallpox	Therapy	Supportive care
	Prophylaxis	Vaccination may be effective if given within the first several days after exposure.
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 <sup>b</sup> 15 mg/kg IV q12h <b>or</b> Levofloxacin 10-15 mg/kg IV q24h <b>or</b> Chloramphenicol <sup>c</sup> 25m/kg 6qh (max 4 gm/day)
	Prophylaxis	Doxycycline 2.2 mg/kg PO q12h <b>or</b> Ciprofloxacin <sup>b</sup> 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 <sup>d</sup>
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 x 5

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

<sup>a</sup> In a mass casualty setting, parenteral therapy might not be possible. In such cases, oral therapy (with analogous agents) may need to be used.

<sup>b</sup> Ofloxacin (and possibly other quinolones) may be acceptable alternatives to ciprofloxacin or levofloxacin; however, they are not approved for use in children.

<sup>c</sup> Concentration should be maintained between 5 and 20 mcg/mL. Some experts have recommended that chloramphenicol be used to treat patients with plague meningitis, because chloramphenicol penetrates the blood-brain barrier. Use in children younger than 2 may be associated with adverse reactions but might be warranted for serious infections.

<sup>d</sup> Ribavirin is recommended for arenavirus or bunyavirus infections, and may be indicated for a viral hemorrhagic fever of an unknown etiology although not FDA approved for these indications. For intravenous therapy use a loading dose: 30 kg IV once (max dose, 2 gm), then 16 mg/kg IV q6hr for 4 days (max dose, 1 gm) and then 8 mg/kg IV q8hr for 6 days (max dose, 500 mg). In a mass casualty setting, it may be necessary to use oral therapy. For oral therapy, use a loading dose of 30 mg/kg PO once, then 15 mg/kg/day PO in 2 divided doses for 10 days.

<sup>e</sup> For children younger than 8 years. For children older than 8 years, adult regimens are recommended. Oral drugs should be given for 6 wk. Gentamicin, if used, should be given for the first 5 days of a 6-wk course of TMP/SMX (trimethoprim/sulfamethoxazole).

**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	Anticholine sterase: muscarinic, nicotinic, and CNS effects	Vapor: miosis, rhinorrhea, dyspnea	Vapor: seconds	Vapor: fresh air, remove clothes, wash hair	ABCs Atropine <sup>b,c,d</sup> : 0.05 mg/kg IV, IM (min 0.1mg, max 5 mg), repeat q2-5 min prn for marked secretions, bronchospasm Pralidoxime <sup>e</sup> : 25 mg/kg IV, IM (max 1 g IV; 2 g IM), may repeat within 30-60 min prn, then again q1hr for 1 or 2 doses prn for persistent weakness, high atropine requirement Diazepam: 0.3 mg/kg (max 10 mg) IV; Lorazepam: 0.1 mg/kg IV, IM (max 4 mg); Midazolam: 0.2 mg/kg (max 10 mg) IM prn seizures, or severe exposure
		Liquid: Diaphoresis, Vomiting  Both: coma, paralysis, seizures, apnea	Liquid: minutes to hours	Liquid: remove clothes, copious washing of skin and hair with soap and water, ocular irrigation	
<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	Seconds	Fresh air Skin: soap and water	Airways, breathing, circulatory support; 100% oxygen Sodium bicarbonate prn for metabolic acidosis Sodium nitrite (3%): Dosage (mL/kg)    Estimated Hgb (g/dL) For average child 0.28                      10 0.34                      12 0.40                      14 Max 10 mL Sodium thiosulfate (25%) 1.65 mL/kg (max 50 mL)
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### 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	Ophthalmics topically, 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>b</sup> Intraosseous route is likely equivalent to intravenous.

<sup>c</sup> Atropine might have some benefit via endotracheal tube or inhalation, as might aerosolized ipratropium.

<sup>d</sup> As of September 2004, the FDA has approved pediatric autoinjectors of atropine in 0.25, 0.5, and 1 mg sizes. Recommendations are:

Approx Age	Approx Wt	Autoinjector Size
<6 mo	<15 lb	0.25 mg
6 mo–4 yr	15–40 lb	0.5 mg
5–10 yr	41–90 lb	1 mg
>10 yr	>90 lb	2 mg (adult size)

<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.

**Table 5. Autoinjector Usage**

When using adult autoinjectors, appropriate atropine and pralidoxime dosing for children may be estimated as follows. If pediatric autoinjectors are available and it is operationally practical, the standard 2.0 mg atropine in a Mark-I kit may be replaced with a pediatric atropine autoinjector or the pediatric atropine autoinjector may be combined with a pralidoxime autoinjector. With this approach use the table below to determine the number of pralidoxime autoinjectors. This approach is not possible with DuoDote as this is provided as a single unit with both medications.

APPROXIMATE AGE	APPROXIMATE WEIGHT	NUMBER OF AUTOINJECTORS (EACH TYPE)	ATROPINE DOSAGE RANGE (MG/KG)	PRALIDOXIME DOSAGE RANGE (MG/KG)
3-7 yrs	13-25 kg	1	0.08-0.13	24-46
8-14 yrs	26-50 kg	2	0.08-0.13	24-46
>14 yrs	>51 kg	3	0.11 or less	35 or less

Each Mark-1 kit contains two autoinjectors (0.8 inch needle insertion depth), one each of atropine 2 mg (0.7 mL) and pralidoxime 600 mg (2 mL), to be administered in two separate intramuscular sites. DuoDote provides the same medications, atropine 2.1 mg (0.7 mL) and pralidoxime 600 mg (2 mL), but as a single Autoinjector with the need for only one intramuscular injection; while not approved for pediatric use, they should be used as initial treatment in circumstances for children with severe, life-threatening nerve agent toxicity for whom IV treatment is not possible or available or for whom more precise IM (mg/kg) dosing would be logistically impossible (especially pre-hospital). Suggested dosing guidelines are offered; note potential excess of initial atropine and pralidoxime dosage for age/weight, although within general guidelines for recommended total over first 60-90 min of therapy for severe exposures.

This table lists usage of the Mark-1 kit or DuoDote only down to age 3 based on adherence to recommended dosages for atropine and pralidoxime. However, if an adult Mark-1 kit or DuoDote is the only available source of atropine and pralidoxime after a bona fide nerve agent exposure, it should be administered to even the youngest child.

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

PATIENT AGE	EXPOSURE, Gy (RAD)	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 (only solution available at the time of the conference was ThyroShield™).

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 (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 16.25 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 3 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 8.125 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> (Epogen, 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.

## NOTES