



Columbia University
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OF PUBLIC HEALTH

NATIONAL CENTER FOR DISASTER PREPAREDNESS

Pediatric Preparedness for Disasters and Terrorism A National Consensus Conference

EXECUTIVE SUMMARY
2003



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OVERVIEW

In a time of crisis, it is essential to ensure the needs of children are being met in planning and preparing for disasters and terrorist events. The current adult models and guidelines cannot be applied to the care of children. 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 pediatrics, pediatric emergency medicine, pediatric critical care, pediatric surgery, and emergency management, including disaster planning, 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 children in disasters.
- Create a research agenda to address knowledge gaps based on the limited data that exist on the needs of children in disasters.

INTRODUCTION

A disaster is an event that destroys property, causes injury or loss of life, and affects a large population or area. In planning responses to disasters or mass casualty incidents, important aspects to be considered are the type of disaster, extent of damage, useable and available resources, and size and nature of the population involved. Disaster preparedness begins with the primary response (emergency and trauma care), and progresses through the secondary response (working with family of the victims and continuing hospital care), and tertiary response (rehabilitation, response to emotional distress, and the treatment of additional physical problems that may arise from such distress). Historically, most aspects of planning have considered only the needs of adults.

Children have unique needs that have rarely been considered in disaster planning. Therefore, it is essential to define the needs of children and to plan for their care. Planning must consider children who are at home, in school or daycare, or in transit, as well as children who for various reasons cannot be reunited with their families. Children with special health care needs are particularly vulnerable, even more so if their survival depends on technological means.

The unique needs of children in terrorism planning and preparedness may be even more important than those for disaster preparedness and are more divergent than those of adults. Clearly, there is a dangerously insufficient understanding regarding the specific needs and challenges of recognizing and responding to chemical, biological, or nuclear weapons, as well as to other disasters. And far less has been done to create support systems specifically for children than for adults. Children are different from adults in many ways, making specific pediatric planning crucial to ensure optimal management of children at risk of exposure to chemical, biological, or nuclear agents. Following are some of the special considerations that apply to children in terrorism and disaster planning and preparedness.

Special Pediatric Considerations in Terrorism and Disaster Preparedness

- Children are more vulnerable 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 decontaminated in adult decontamination units.
- Children require different dosages or different antibiotics and antidotes to many agents.
- Children are more susceptible to the effects of radiation exposure and require different responses than adults.
- Children have unique psychological 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 require special expertise and training to ensure optimal care of those exposed to chemical, biological, or nuclear agents.
- Children's developmental ability and cognitive levels may impede their ability to escape danger.
- EMS, medical, and hospital staff may not have pediatric training, equipment, or facilities available.

Traditionally, thinking has focused on military personnel as the potential victims of biological, chemical, or radiologic attacks. Therefore, the treatments, antidotes, and research needed to help such victims have 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 radiologic weapons. As a result, current efforts must include research, planning, and preparation for pediatric victims of terrorist events.

Emergency planners and emergency responders must shift their thinking to include the care of all victims in times of terrorist events. This includes considering children as possible victims and planning for the needs of children in training and equipment. Most importantly, emergency planners and responders cannot approach the care of children by simply modifying current practices. The unique anatomy and physiology of children necessitates a unique approach to assessment and treatment, including the use of pediatric-specific equipment and medications, which must be dosed appropriately according to age and weight.

Planning for and responding to disasters has traditionally been the responsibility of government agencies. The Federal Emergency Management Agency (FEMA) is involved in declared national emergencies; one of its many

functions is to provide Disaster Medical Assistance Teams (DMATs) through the National Disaster Medical System (NDMS). Other federal agencies involved in disaster relief planning include the Department of Transportation, Department of Defense, Department of Housing and Urban Development, Department of Homeland Security, 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 and aftermath response and planning have included the involvement of neighborhoods and families, and have even begun to address needs at the individual level. Volunteer organizations, such as the Red Cross and Salvation Army, also have key roles in disaster response. Academic schools of medicine and schools of public health have provided the foundation for this planning based on their research and collections of expertise. In the future, these institutions will 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 by national professional organizations by themselves do little to ensure an organized response to pediatric disasters. They carry more weight if they are both explicitly endorsed by local public health and safety authorities, and fully integrated into local disaster preparedness initiatives. Unfortunately, because of the lack of data, these policies are often based on a “best advice” approach. Moreover, without a consistent approach regarding the effects of disaster and terrorist events 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 state offices of emergency management, 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.

Goals of Pediatric Disaster Planning

Integrating pediatric needs into federal, state, and regional/local disaster planning is critical. According to unpublished data produced by FEMA in 1997, no state disaster plans included pediatric issues. To correct this deficiency, existing data on the needs of children in disasters must be evaluated, consensus must be established in those areas where data does not exist, and a research agenda to fill the identified voids must be developed and implemented.

The Program for Pediatric Preparedness is currently working on a Model Pediatric Component for State Disaster Plans, which is funded by a grant from Health and Human Services, Health Resources and Services Administration, Maternal Child Health Bureau, Emergency Medical Services for Children. As part of this process, we conducted a literature review to determine what data currently exist on the specific needs of children 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 is an immediate need for direction on the needs of children in disaster and terrorism planning and response.

In an effort to provide guidance for those who take care of our children today and for those who will initiate research in the future, we organized and held a National Consensus Conference on Pediatric Preparedness in Disasters and Terrorism. Our goal was to develop consensus recommendations as well as a research agenda on the needs of children in disaster and terrorism preparedness.

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, 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 the 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.

Participant Backgrounds

Conference participants represented a cross-section of all those with expertise, responsibility, and authority to make decisions that would affect 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 since 9/11/01. 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.

Staff members from the Children's Health Fund and The Program for Pediatric Preparedness were also present to assist with the meeting.

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Note: Although these individuals were appointed to represent their organizations, and the comments contained in this document represent the participants' input, formal approval of this summary was not obtained from the boards of these organizations.

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PRIORITY RECOMMENDATIONS

While all recommendations and guidelines developed at the consensus meeting were felt to be critical to ensure the minimum disaster and terrorism preparedness for children, the following recommendations were felt to be of the utmost priority and should be implemented immediately. These priority recommendations are also listed throughout the recommendation sections which follow in this document and are indicated in bold.

- Incorporate use of a pediatric-specific triage system by all first responders and hospital personnel. At this time, JumpSTART Pediatric Multiple Casualty Incident Triage is the only objective triage system that addresses the needs of children. This will provide guidance for triage personnel making potential life and death decisions that otherwise may be influenced by emotional issues when triaging children.
- Equip emergency medical services (EMS) personnel and response vehicles with pediatric-specific equipment and medications. This includes supplies for decontamination and assessment/treatment for biological, chemical, and radiological terrorism.
- 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.
- Keep a 48-hour supply of pediatric equipment and pharmaceuticals on hand for the average daily number of patients plus an additional 100 patients.
- Include a detailed pediatric component in Web-based hospital resource availability networks.
- 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.
- Involve pediatric specialty care experts in regional and statewide disaster planning, local preparedness, and evacuation protocols of public health agencies, including emergency transport and treatment policies and processes.
- Require pediatric medical guidance for all DMATs and involve care providers who have specific training in pediatrics during deployment, including on specialty teams.
- Include adequate supplies of pediatric equipment and pharmaceuticals in all NDMS basic loads supplied to DMATs.
- Prepare, regularly update, and practice an office disaster plan.
- Provide guidance on home disaster preparedness and encourage families to develop family disaster plans, which may include distribution of the Family Readiness Kit (endorsed by the American Academy of Pediatrics [AAP]).
- Develop plans for communication, health care delivery, contacting and reuniting children and their families in communities, local school districts, and child care facilities. Integrate these plans into state, regional, and local disaster plans.
- Develop plans in government agencies for temporary medical and mental health care, shelter, guardianship, and placement of children during disaster and terrorist events in case of injured or deceased family members.
- Facilitate prompt communication among family members in community disaster plans. Develop evacuation plans that allow for contacting and reuniting children with their families.
- Keep all agents listed in Tables 2 and 3 in appropriate dosages and forms for administration to children in all biologic, chemical, and radiological terrorism medication provision plans. This would include the NPS, Push Packs, state and local health department stocking and deployment of these agents, and local responder and chemical terrorism treatment provisions.
- Include provisions for study and/or use in children in any new investigational vaccine studies.
- Use Mark 1 Autoinjector kits, 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.
- Expedite approval of the pediatric autoinjector kit that is currently produced and marketed abroad but not available in the United States.
- Keep all agents listed in Table 4 available and in appropriate dosages and forms for children in all chemical terrorism medication provision plans. This would include the NPS, Push Packs, state and local health department stocking and deployment of these agents, and local responder and chemical terrorism treatment provisions.

- Develop plans and distribution systems in all localities that provide for KI administration within 2 hours 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 great as a 50-mile radius.
- Adhere to graded dosing of KI whenever possible. If local emergency planners conclude that graded dosing is logistically impractical for populations at risk for radioiodine exposure, the overall benefits of receiving 130 mg of KI instead of the lower doses recommended for certain age groups far exceed the small risks of overdosing.
- If KI dosing based on projected thyroid radioactive exposure is logistically impractical during a radiological emergency, administer KI to children at the lowest possible threshold which is greater than or equal to 5cGy projected internal thyroid exposure in children.
- 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.
- Enhance pre-existing children's mental health infrastructure as a necessary part of disaster preparedness.
- Conduct pediatric disaster drills in every school, every year, in partnership with school organizations, local response agencies, appropriate governmental authorities and, where appropriate, supervised youth groups.

THE RECOMMENDATIONS

The final recommendations of the conference focused on eight major areas:

- 1) emergency and prehospital care,
- 2) hospital care,
- 3) emergency preparedness,
- 4) terrorism preparedness and response,
- 5) mental health needs,
- 6) school preparedness and response,
- 7) training and drills, and
- 8) future research agenda and funding.

The specific recommendations can be found in the sections that follow.

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 the needed care.

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

Triage

- **Incorporate use of a pediatric-specific triage system by all first responders and hospital personnel. At this time, JumpSTART Pediatric Multiple Casualty Incident Triage is the only objective triage system that addresses the needs of children. This will provide guidance for triage personnel making potential life and death decisions that otherwise may be influenced by emotional issues when triaging children.**
- Designate a pediatric-specific triage process (currently, JumpSTART, as described above) for use in training by first responders and emergency personnel.
- Continue to develop, improve, and implement triage systems that are objective and child-specific to advance the efficiency and accuracy of triage.
- Ensure integration and consistency of use of pediatric triage processes among local, state, and federal responders, including Disaster Medical Assistance Teams (DMATs).
- Develop and use pediatric-specific triage systems that address primary, secondary, and tertiary triage. These will address all aspects of disaster triage, including psychological triage, triage for weapons of mass destruction (WMD), and triage for children with special health care needs.
- Include evaluation of triage processes and performance in quality assessment procedures (performed after the event) at local and state levels, as well as in future research initiatives.

Prehospital Care

- **Equip emergency medical services (EMS) personnel and response vehicles with pediatric-specific equipment and medications. This includes supplies for decontamination and assessment/treatment for biological, chemical, and radiological terrorism.**
- Establish model guidelines and best practices for communication, documentation, community involvement, equipment, medical oversight and strong Incident Command Systems, protocols for basic life support and advanced life support, children with special health care needs, and schools (both public and private).

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 who may be needed in times of emergency or by other facilities, or both.

All of these elements are important considerations with regard to the needs of children. During a disaster or terrorist event, children will undoubtedly arrive at general hospitals. Therefore, all hospitals must be prepared for a greater number of pediatric victims than usual. Specialty centers must also be prepared for increased pediatric needs, in addition to their general importance. Staff and physician volunteer programs that 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

- **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.**
- **Keep a 48-hour supply of pediatric equipment and pharmaceuticals on hand for the average daily number of patients plus an additional 100 patients.**
- **Include a detailed pediatric component in Web-based hospital resource availability networks.**
- Engage in a pediatric-specific disaster risk assessment with the community, including school districts, the Office of Emergency Services, EMS, the police department, the fire department, private practitioners, child welfare organizations, child care establishments, public health organizations, and mental health facilities.
- Develop informational resources and training for pediatric-specific responses to biological, chemical, and radiological terrorism.
- Ensure that all hospital emergency operations and preparedness policies include pediatric care and treatment guidelines and account for the unique aspects and needs of children.
- Ensure that all agents and equipment that are stocked for disaster and terrorism preparedness are either specifically for pediatric use or can be appropriately substituted for pediatric use.

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

- **Designate a pediatric specialty resource center and system in every regional and state disaster plan to include—at a minimum—pediatric critical care, pediatric trauma, and pediatric burn capabilities.**
- Form disaster medical and psychological incident response teams capable of managing pediatric patients in every region. The Metropolitan Medical Response System (MMRS) and Community Response Teams must plan for and receive training in the care of pediatric patients. The MMRS must include appropriately trained providers and provision for pediatric equipment.

- Promote communication and consultation between facilities by availability of multiple horizontal communication systems that include patient records and medical information.
- Involve pediatric-trained providers in physician volunteer programs. Such programs must have plans to provide pediatric-trained providers to facilities that need additional support in disaster events.
- Fund regional planning efforts.
- Develop multiple systems capable of transporting pediatric patients to link patient care resources.

EMERGENCY PREPAREDNESS

Preparedness for terrorist events should be based on our existing foundation of preparedness for other emergencies. 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 to be prepared for any and all types of emergencies. Based on this solid foundation, we can then direct these resources to cope appropriately 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

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

Natural Disasters

- Approach disaster planning and education by initially analyzing 1) the specific risks, 2) the injury/illness to children, and 3) the desirable and undesirable responses.
- Include a pediatric section in all federal, state, and regional/local emergency operations plans and address the unique needs of children in all Emergency Support Functions and Annexes.
- Involve pediatric specialty care experts in regional and statewide disaster planning.

Disaster Medical Assistance Teams (DMATs) and the National Disaster Medical System (NDMS)

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

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 disaster and terrorist events. Primary care providers have numerous roles and are invaluable in pediatric terrorist and disaster preparedness. They should:

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

Shelters

- Convene a national consensus conference on disaster sheltering of children and families that is federally funded and conducted and includes deliverables. Include parties with interests in shelter issues to establish best practices and those with expertise on issues regarding children and families.
- Support the active role of the NDMS in mass care and sheltering, particularly with regard to medical and mental health care of children and families.

Ensure that all shelters have/can provide the items listed in the following table:

Table 1. Pediatric Item Requirements for Shelters

NUTRITION, SLEEPING ARRANGEMENTS, AND RECREATIONAL AND THERAPEUTIC ACTIVITIES THAT ARE ALL 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)

- Incorporate considerations for CSHCN in all disaster and terrorism planning at the national, state, and regional/local levels (eg, water, dialysis, medication).
- Identify all CSHCN to ensure each child has a medical home, adequate medical coverage, and support mechanisms before a disaster or terrorist event.
- Ensure that all CSHCN are considered in emergency preparedness plans of the Department of Homeland Security.
- Develop mechanisms for identification of and community planning for children with increased vulnerability in disasters, including CHSCN and their families, at the national, state, and regional/local levels.
- Provide federal, state, and local government funding for emergency preparedness planning and implementation of services to meet the needs of CSHCN. This funding must be timely, immediately accessible, and of sufficient duration.
- Explore, within government agencies, development of non-traditional, community-based support systems for CSHCN and their families (eg, independent living centers, faith-based groups, parent-based groups).
- Mandate continuity of operations and mutual aid planning among community health facilities to address disaster and terrorist events for pediatric populations, including CSHCN.

Displaced Children

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

TERRORISM PREPAREDNESS AND RESPONSE

Once the needs of children have been addressed in general for all types of emergencies, preparedness specifically for 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 National Pharmaceutical Stockpile (NPS).

Biological Terrorism

AGENT AVAILABILITY

- **Keep all agents listed in Tables 2 and 3 in appropriate dosages and forms for children in all bioterrorism medication provision plans. This would include the Strategic National Stockpile (Push Packs, Vendor Managed Inventory), state and local health department stocking and deployment of these agents, and local responder and chemical terrorism treatment provisions.**

CHEMOTHERAPY AND CHEMOPROPHYLAXIS

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

IMMUNOTHERAPY AND IMMUNOPROPHYLAXIS

- **Include provisions for study and/or use in children in any new investigational vaccine studies.**
- **Anthrax:** The currently licensed anthrax vaccine (Anthrax Vaccine Adsorbed, AVA, Bioport, Lansing, MI) is approved for persons 18-65 years old. This vaccine may have a limited role as an adjunct to post-exposure chemoprophylaxis, although data are limited. *There is limited potential for use of this vaccine in a civilian pre-exposure setting, but advocate that future studies of new generation vaccines include children.*
- **Smallpox:** The currently licensed smallpox vaccine (Dryvax, Wyeth, Philadelphia, PA) makes no mention in its package insert of an approved age range. In practice, until the early 1970s, this vaccine was administered to 1-year-olds. The CDC currently recommends against vaccination of children younger than 1 year. *All contraindications to smallpox vaccination are relative. After bona fide exposure or known usage of weaponized smallpox, even the youngest exposed at-risk infants should be vaccinated. Moreover, future studies of new generation vaccines must include children.*
- **Botulism:** A licensed trivalent (types A, B, E) antitoxin is available through the CDC. *This antitoxin is to be used in children of any age known to have been exposed to botulinum toxin of the appropriate serotypes. An IND pentavalent (types A-E) Botulinum Immune Globulin (human) is available through the California Department of Health specifically for the treatment of infantile botulism. The study of this product must be continued and that licensure be pursued.*
- **Plague:** No licensed plague vaccine is currently in production. A previously licensed vaccine was approved only for persons 18-61 years old. *There is little, if any, role for this or similar vaccines in a bioterrorist context.*

PHYSICAL PROTECTION

- *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.*
- 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
Inhalational	Therapy ^a 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 ^b of therapy.	Ciprofloxacin ^c 10-15 mg/kg IV q12h (max 400 mg/dose) or Doxycycline 2.2 mg/kg IV(max 100mg) q12h and Clindamycin ^d 10-15 mg/kg IV q8h and Penicillin G ^e 400-600k u/kg/d IV divided q4h
Inhalational	Post-exposure prophylaxis (60-day course ^b)	Ciprofloxacin ^f 10-15 mg/kg PO (max 500 mg/dose) q12h or Doxycycline 2.2 mg/kg (max 100mg) PO q12h
Cutaneous, endemic	Therapy ^g	Penicillin V 40-80 mg/kg/d PO divided q6h or Amoxicillin 40-80 mg/kg/d PO divided q8h or Ciprofloxacin 10-15 mg/kg PO (max 1 gm/day) q12h or Doxycycline 2.2 mg/kg PO(max 100mg) q12h
Cutaneous (in setting of terrorism)	Therapy ^a	Ciprofloxacin 10-15 mg/kg PO (max 1 gm/day) q12h or Doxycycline 2.2 mg/kg PO(max 100mg) q12h
Gastrointestinal	Therapy ^a	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

- ^a In a mass casualty setting, in which resources are severely limited, oral therapy may need to be substituted for the preferred parenteral option. This may be most acceptable for ciprofloxacin because it is rapidly and well absorbed from the gastrointestinal tract with no substantial loss from first pass effect.
- ^b Children may be switched to oral amoxicillin (40-80 mg/kg/d divided q8h) to complete a 60-day course (assuming the organism is sensitive). We recommend that the first 14 days of therapy or post-exposure prophylaxis, however, include ciprofloxacin and/or doxycycline regardless of age. A three-dose series of vaccine may permit shortening of the antibiotic course to 30 days.
- ^c Levofloxacin or ofloxacin may be acceptable alternatives to ciprofloxacin.
- ^d Rifampin or clarithromycin may be acceptable alternatives to clindamycin as drugs that target bacterial protein synthesis. If ciprofloxacin or another quinolone is used, doxycycline may be used as a second agent because it also targets protein synthesis.
- ^e Ampicillin, imipenem, meropenem, or chloramphenicol may be acceptable alternatives to penicillin as drugs with good CNS penetration.
- ^f According to most experts Ciprofloxacin is the preferred agent for PO prophylaxis.
- ^g 10 days of therapy may be adequate for endemic cutaneous disease. However, a full 60-day course is recommended in the setting of terrorism 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, AGENT, AND DOSAGE ^a
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 or Streptomycin 15 mg/kg IM q12h (max 2gm/day, although only available for compassionate usage and in limited supply is a preferred agent) or Doxycycline 2.2 mg/kg IV q12h (max 200 mg/day) or Ciprofloxacin 15 mg/kg IV q12h or Chloramphenicol ^b 25 m/kg q6H (max 4 gm/day)
	Prophylaxis	Doxycycline 2.2 mg/kg PO q12h or Ciprofloxacin ^c 20 mg/kg PO q12h
Tularemia	Therapy	Same as for plague
Botulism	Therapy	Supportive care, antitoxin may halt progression of symptoms but is unlikely to reverse them
Viral Hemorrhagic Fevers	Therapy	Supportive care, ribavirin may be beneficial in select cases ^d
Brucellosis	Therapy ^e	TMP/SMX 30 mg/kg PO q12h and Rifampin 15 mg/kg q24h or Gentamicin 7.5 mg/kg IM qdx5

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

- ^a In a mass casualty setting, parenteral therapy might not be possible. In such cases, oral therapy (with analogous agents) may need to be used.
- ^b Concentration should be maintained between 5 and 20 mcg/mL; Some experts have recommended that chloramphenicol be used to treat patients with plague meningitis, since 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.
- ^c Other fluoroquinolones (levofloxacin, ofloxacin) may be acceptable substitutes for ciprofloxacin; however, they are not approved for use in children.
- ^d Ribavirin is recommended for Arenavirus, Bunyavirus 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 (maximum dose, 2 gm), then 16 mg/kg IV every 6 hr for 4 days (maximum dose, 1 gm) and then 8 mg/kg IV every 8 hr for 6 days (maximum 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.
- ^e For children younger than 8 years. For children older than 8 years, adult regimens are recommended. Oral drugs should be given for 6 weeks. Gentamicin, if used, should be given for the first 5 days of a 6-week course of TMP/SMX (trimethoprim/sulfamethoxazole).

Chemical Terrorism

- Use Mark 1 Autoinjector kits, 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.
- Expedite approval of the pediatric autoinjector kit that is currently produced and marketed abroad but not available in the United States.
- 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 NPS, Push Packs, state and local health department stocking and deployment of these agents, and local responder and chemical terrorism treatment provisions.
- 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 (eg, poison control centers, CDC, etc).
- Provide educational programs on possible chemical terrorism for EMS and community health care workers (eg, school nurses) and provide for ongoing training and assessment.
- Publicly disseminate a condensed version of this information and include advice on the mental health care of children. This information should be reviewed by professional organizations and/or government agencies to ensure that it is appropriate for the general public.
- Include pediatric and mental health input in decontamination and treatment protocols in state, regional, and local EMS plans. This implies some national consensus process for hospital-based decontamination.
- 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 NPS must include adequate provisions for pediatric dosing and administration of antidotes.
- Immediately foster the development and approval of pediatric-sized autoinjectors for atropine and pralidoxime.
- Ensure that EMS and emergency departments have protocols for rapid delivery of critical nerve agent antidotes and for use of the current Mark 1 autoinjector in children.
- Make cyanide antidotes, with clear size-adjusted dosing regimens, widely available.
- 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.
- Fund the AAP and/or other recognized authorities to develop a course covering pediatric consideration for Weapons of Mass Destruction. Support and provide for continuing assessment and drills.
- Treatment protocols for chemical terrorism should be based 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 ³	MANAGEMENT
NERVE AGENTS					
Tabun, sarin, soman, VX	Anticholinesterase: muscarinic, nicotinic, and CNS effects	Vapor: miosis, rhinorrhea, dyspnea Liquid: Diaphoresis, vomiting <i>Both:</i> coma, paralysis, seizures, apnea	Vapor: seconds Liquid: minutes to hours	Vapor: fresh air, remove clothes, wash hair Liquid: remove clothes, copious washing of skin and hair with soap and water, ocular irrigation	Airway, breathing, circulatory support Atropine 0.05-0.1 mg/kg IV ^b , IM ^c (min 0.1 mg, max 5 mg), repeat q2-5 min prn for marked secretions, bronchospasm, hypoxia, respiratory compromise, apnea, cardiopulmonary arrest Pralidoxime 25-50 mg/kg IV, IM ^d (max 1 g IV; 2 g IM), may repeat within 30-60 min prn, then again q1h for 1 or 2 doses prn for persistent weakness, high atropine requirement Diazepam 0.05-0.3 mg/kg (max 10 mg) IV, lorazepam 0.1 mg/kg IV or IM (max 4 mg), midazolam 0.1-0.2 mg/kg (max 10 mg) IM prn for seizures or severe exposure
VESICANTS					
Mustard	Alkylation	Skin: erythema, vesicles Eye: inflammation Respiratory tract: inflammation, respiratory distress, acute respiratory distress syndrome	Hours Immediate pain	Skin: soap and water Eyes: irrigation (water) <i>Both:</i> major impact only if done within minutes of exposure	Symptomatic care Possibly British anti-lewisite (BAL), 3 mg/kg IM q4-6h for systemic effects of lewisite in severe cases
Lewisite	Arsenical				
PULMONARY AGENTS					
Chlorine, phosgene	Liberate HCl, alkylation	Eyes, nose, throat irritation (especially chlorine) Bronchospasm, pulmonary edema (especially phosgene)	Minutes Bronchospasm: minutes Pulmonary edema: hours	Fresh air Skin: water	Symptomatic care
Cyanide	Cytochrome oxidase inhibition: cellular anoxia, lactic acidosis	Tachypnea, coma, seizures, apnea	Seconds	Fresh air Skin: soap and water	Airway, breathing, circulatory support; 100% oxygen Sodium bicarbonate prn for metabolic acidosis Sodium nitrite (3%): Dosage (ml/kg) Estimated Hgb (g/dl) for average child 0.27 10 0.33 12 0.39 14 Maximum 10 ml Sodium thiosulfate (25%) 1.65 ml/kg (maximum 50 ml)
PULMONARY 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: irrigation (water)	Topical ophthalmics, symptomatic care

^a Decontamination, especially for patients with significant exposure to nerve agents or vesicants, should be performed by health care providers dressed in adequate personal protective equipment. For emergency department staff, this consists of a non-encapsulated, chemically resistant body suit, boots, and gloves with a full-face air purifier mask/hood.

^b Intraosseous route is likely equivalent to intravenous.

^c Atropine might have some benefit via endotracheal tube or inhalation, as might aerosolized ipratropium.

^d Pralidoxime is reconstituted to 50 mg/ml (1 g in 20 ml water) for IV administration, and the total dose is infused over 30 min, or it 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 (1 g added to 3 ml water – by analogy to the Mark 1 autoinjector concentration), to effect a reasonable volume for injection.

Key: Hgb = hemoglobin; prn = as needed

Table 5. Autoinjector Usage

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

Note: 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); 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. 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-1kit only down to age 3 based on adherence to recommended dosages for atropine and pralidoxime. However, if an adult Mark-1kit is the only available source of atropine and pralidoxime following a nerve agent exposure, it should be administered to even the youngest child. In such a situation one should follow weight based dosing guidelines.*

Radiologic Terrorism

- **Develop plans and distribution systems in all localities that provide for KI administration within 2 hours 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 great as a 50-mile radius.**
- **Adhere to graded dosing of KI whenever possible. If local emergency planners conclude that graded dosing is logistically impractical for populations at risk for radioiodine exposure, the overall benefits of receiving 130 mg of KI instead of the lower doses recommended for certain age groups far exceed the small risks of overdosing.**
- **If KI dosing based on projected thyroid radioactive exposure is logistically impractical during a radiological emergency, administer KI to children at the lowest possible threshold which is greater than or equal to 5cGy projected internal thyroid exposure in children.**
- Facilitate development of a pediatric preparation of KI.
- 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 adults.
- Increase the knowledge base among all pediatric care providers about medical and psychological aspects of radiation exposure.
- Except as stated above, ensure that the dosing of KI conforms to Tables 6, 7 and 8.
- Assure 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 those listed in Table 9.
- Include in all medication availability for radiologic exposure anti-emetics to treat the emesis caused by this exposure and prevent dehydration for which children have increased susceptibility.
- Ensure availability of all of the medications listed in Table 10 for treatment of radiological internal contamination and that all testing of these agents and treatment protocols for these agents include considerations for the treatment of children.

Table 6. Guidelines for KI Dose Administration

PATIENT/AGE	EXPOSURE, GY (RAD)	KI DOSE ^a (MG)
>40 years of age	>5 (500)	130
18-40 years of age	0.1 (10)	130
12 through 17 years of age	0.05 (5)	65
4 through 11 years of age	0.05 (5)	65
1 month through 3 years of age	0.05 (5)	32
Birth through 1 month of age	0.05 (5)	16
Pregnant or lactating women	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

^a Children/adolescents weighing more than 70 kg should receive the adult dose (130 mg).

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

- 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 (eg, raspberry) to the KI/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 Tablet¹¹

- 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 (eg, raspberry) to the KI/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

AGENT	ACTION	DOSAGE ^b
Epoetin Alpha ^a (Epoen, Procrit)	Induces erythropoieses	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)

^a Epoetin Alpha may also be useful to reduce the overall requirements for blood transfusion in any mass casualty incident.

^b 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

ELEMENT	RESPIRATORY ABSORPTION	GI ABSORPTION	SKIN WOUND ABSORPTION	PRIMARY TOXICITY	TREATMENT
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 ₃ to alkalinize urine

Decontamination

- Design decontamination systems so that they can be used for decontamination of children of all ages (including infants), of the parentless child, of the non-ambulatory child, and of the child with special health care needs.
- Address the following pediatric considerations in all federal, state, and regional/local protocols and guidance for decontamination: 1) water temperature and pressure (high-volume, low-pressure, heated water systems), 2) non-ambulatory children, 3) children with special health care needs, and 4) clothing after decontamination.

Strategic National Stockpile (SNS)

- Address the unique needs of children in the SPS by assuring 1) availability in all phases, 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 SPS program, as well as in planning and implementation.
- Coordinate distribution of pediatric specific supplies, including SPS, in state and regional/local disaster plans.
- Require external review by a federal multidisciplinary pediatric advisory board for all federal, state, and regional/local equipment and pharmaceutical stock piles.

MENTAL HEALTH NEEDS

A key component of care of children is care not only for their physical needs but also for their mental health needs. While often thought of only after a disaster has occurred, mental health needs should be considered throughout all phases of emergency preparedness including response, recovery, and mitigation.

The following recommendations address the mental health needs of children both during and after a disaster, as well as the need to better prepare children to handle the threat or reality of future events.

Mental Health Needs During Disaster and Terrorist Events

- Incorporate mental health needs, including the specific 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.
- Recognize and consider the mental health implications of announcements and preparedness activities.
- Create infrastructure to address the mental health needs of children and families in times of disaster or crisis.
- 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.
- 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. Attention by schools to mental health needs of children should be seen as complementary to, and not competing with, their primary educational mission. Funding must be made available to local boards of education to support these activities and to form partnerships with mental health providers and organizations.
- Develop guidelines and mechanisms for coordination among federal, state, and regional/local agencies for mental health services during a crisis. Include mental health needs in the Incident Command System.
- Allow for flexibility in funding, recognizing that children and families are vulnerable to a wide range of short- and long-term changes in the aftermath of disasters and emergencies, including, but not limited to, post-traumatic stress reaction, grief, fear, depression, anxiety, sleep disturbances, physical symptoms at school, and social and behavioral difficulties. Include resources for assessing and treating these difficulties in all pediatric disaster response plans.

Mental Health Needs After Disaster and Terrorist Events and Developing Resilience

- **Enhance pre-existing children's mental health infrastructure as a necessary part of disaster preparedness.**
- Provide federal funding for mental health care of children and families after a disaster to include both screening and therapy; such funding must be sufficiently flexible to allow for a response tailored to the needs of local communities and that does not exclude those with pre-existing mental health problems.
- Ensure that children with pre-existing mental health conditions are not excluded from eligibility for mental health care after a disaster or crisis. Such children may be especially vulnerable to post-traumatic stress reactions and a range of other mental health problems after the event.
- Recognize that mental health problems in children may initially present after a disaster or persist over long periods of time and, therefore, time limits on government funding for mental health intervention should be clinically determined. In addition, recognize that children who do not meet criteria for a mental health diagnosis may have significantly impaired functioning and need intervention.
- Provide public information about the immediate and long-term effects of disasters to help parents, teachers, pediatricians, and other community service providers identify children suffering from long-term effects of disaster.
- Advise all caregivers and all those who provide services for children of all ages, public officials, and the media about how to help children cope during times of stress (anniversaries of the event, holidays, life changes, etc) after a disaster. Mental health professionals are instrumental in this effort.
- Recommend a family-centered approach after a disaster that includes, but is not limited to, assessment, early intervention, and treatment with primary caregivers and other family members. Research has shown that good parental functioning after a disaster is a protective factor for children's mental health functioning.

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.

The following recommendations address the needs and ensure the adequacy of school preparedness.

Crisis Management in Schools

- **Conduct pediatric disaster drills in every school, every year, in partnership with school organizations, local response agencies, appropriate governmental authorities and, where appropriate, supervised youth groups.**
- Include school representation on state and regional/local emergency management planning committees.
- Use the Incident Command System in schools.
- Involve parents in school-based planning.
- Enhance emergency responses within schools by:
 - 1) Establishing written agreements with other emergency response agencies (law, health care, emergency planners, American Red Cross, etc)
 - 2) Identifying resources available for emergency preparedness
 - 3) Ensuring the existence of adequate and multiple communication systems.
- Identify sources of funding, starting with the Department of Homeland Security (and then exploring opportunities in existing disaster and terrorism preparedness funding sources), to provide schools with financial resources for emergency preparedness.
- Support current Department of Education efforts to keep schools safe from natural and terrorist disasters.
- Support and fund FEMA efforts to provide emergency preparedness education to school officials and teachers and to integrate school emergency preparedness efforts with overall community and state emergency planning efforts

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.

Weapons of Mass Destruction (WMD)

- 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 WMD event. Funding should be explored with the CDC, the Department of Homeland Security, and other federal agencies.
- Develop the curriculum in a modular format, so that it can be easily included in existing programs and operational procedures and will be relevant to the specialties and level of care to be provided.
- Encourage all appropriate bodies to consider including the curriculum (once established) in their certifying processes, standard curricula, and continuing education programs.

Disaster Training Programs

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

Disaster Simulations and Drills

- 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 (eg, children's hospitals, pediatric societies, day care centers, schools, etc). Such drills should also address the needs of children with special health care needs and children with mental health emergencies.
- Conduct drills with federal, state, and regional/local emergency managers that include exclusively pediatric victims or a majority of pediatric victims in various circumstances (eg, in schools, day care facilities, school buses, etc) to adequately test the capacity of the system to handle pediatric patients.
- Develop educational adjuncts, including simulation software, for disaster and terrorism planning that accounts for events with pediatric patients in proportion to their existence in the population and for events that disproportionately affect children. However, these should not supplant physical pediatric disaster drills or the regional planning efforts necessary to stage them. Such adjuncts should address the variety of ages, developmental levels, and sizes of children who would require care during a disaster or terrorist event, as well as children with special health care needs and children with mental health emergencies.

- Facilitate the development of a model pediatric disaster drill template and related best practices by the federal EMSC program in partnership with other federal agencies. In addition, foster the creation of technical assistance teams to help regions conduct pediatric disaster drills in their areas. Such model drill templates and best practices must address the mental health needs of participants and actors before, during, and after pediatric disaster drills.
- Promote the standardization of pediatric disaster-related vocabulary with respect to incident command structures and field triage tools.

FUTURE RESEARCH AGENDA AND FUNDING

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

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

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

Pediatric Triage and Prehospital Care

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

Natural Disasters

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

Terrorism

- Require that all new pharmaceutical and therapeutic testing include evaluation of applicability and dosing for children.

- Require that all existing antibiotics and antidotes be tested for their applicability to children and determine dosing. Develop delivery methods for these agents that are pediatric-specific, including liquid preparations and mechanisms for weight-based dosing.
- Develop improved drug administration techniques for mass casualty incidents involving children.
- Include children in future studies of new vaccines for anthrax and smallpox and of a multivalent botulism immunoglobulin; in all new antibiotic, vaccine, and immunotherapy development; and in licensure of new nerve agent and other chemical agent antidote kits. These should include use during terrorist incidents, development of optimal dosing schedules for currently available drugs, and pursuing WMD indications for currently licensed medications.
- Include pediatric-specific models in research into optimal preventive and antidotal treatment and supportive care for all cases of WMD.
- Fund research through the National Institutes of Health (NIH) to address the differences in effects of biological, chemical, and radiological agents on children based on their unique anatomy and physiology.
- Require that all new research grant programs funded by NIH (including all its institutes), other federal agencies, and state and local agencies to study, biological, chemical, and radiological terrorism include research into pediatric effects of these agents and treatments.
- Advocate for long-term epidemiologic research, including addressing the needs of children, in WMD.
- Further evaluate optimal decontamination strategies for children.
- Encourage a pediatric component be added to Project Bio-Shield and advocate its passage on Capitol Hill.
- Assess responder safety during different types of WMD and disaster events by federal and state environmental, health, and occupational safety agencies.
- Assess true efficacy of field treatment of children in response to actual biological, chemical, or radiological events.

Mental Health and Psychosocial Needs of Children

- Provide multi-agency (including NIH and its institutes, other federal funding agencies and local funding agencies) Requests for Assistance (RFA) for research on resilience factors, specifically those related to disasters and pediatric post-traumatic stress responses including, but not limited to grief, anxiety, depression, and physical and behavioral responses, with emphasis on integrating research findings into rapid response efforts.
- Develop models for rapid dissemination of post-disaster pediatric research findings and treatment outcome studies and mechanisms for making findings easily accessible to practice communities, thus allowing for research findings to be incorporated into treatment strategies.
- Provide RFAs to support research on testing and evaluating all intervention methodologies used in post-disaster settings, with priority for widely used treatments with limited prior research so that effective interventions can be identified and disseminated.
- Provide RFAs for public mental health research on preparation and dissemination of disaster-related messages and warnings to ameliorate anxiety and adjustment reactions, and to better understand the role of media effects on post-traumatic responses of children and families.
- Form a consensus group to establish ethical guidelines for child and family disaster and post-disaster mental health research.

CONCLUSION AND FUTURE DIRECTIONS

This conference represented a major step forward in the pediatric preparedness for disaster and terrorist events, 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 the first step in improving disaster and terrorism 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, ie, 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 THAT ARE ALL 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
Inhalational	Therapy ^a 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 ^b of therapy.	Ciprofloxacin ^c 10-15 mg/kg IV q12h (max 400 mg/dose) or Doxycycline 2.2 mg/kg IV(max 100mg) q12h and Clindamycin ^d 10-15 mg/kg IV q8h and Penicillin G ^e 400-600k u/kg/d IV divided q4h
Inhalational	Post-exposure prophylaxis (60-day course ^b)	Ciprofloxacin ^f 10-15 mg/kg PO (max 500 mg/dose) q12h or Doxycycline 2.2 mg/kg (max 100mg) PO q12h
Cutaneous, endemic	Therapy ^g	Penicillin V 40-80 mg/kg/d PO divided q6h or Amoxicillin 40-80 mg/kg/d PO divided q8h or Ciprofloxacin 10-15 mg/kg PO (max 1 gm/day) q12h or Doxycycline 2.2 mg/kg PO(max 100mg) q12h
Cutaneous (in setting of terrorism)	Therapy ^g	Ciprofloxacin 10-15 mg/kg PO (max 1 gm/day) q12h or Doxycycline 2.2 mg/kg PO(max 100mg) q12h
Gastrointestinal	Therapy ^a	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

- ^a In a mass casualty setting, in which resources are severely limited, oral therapy may need to be substituted for the preferred parenteral option. This may be most acceptable for ciprofloxacin because it is rapidly and well absorbed from the gastrointestinal tract with no substantial loss from first pass effect.
- ^b Children may be switched to oral amoxicillin (40-80 mg/kg/d divided q8h) to complete a 60-day course (assuming the organism is sensitive). We recommend that the first 14 days of therapy or post-exposure prophylaxis, however, include ciprofloxacin and/or doxycycline regardless of age. A three-dose series of vaccine may permit shortening of the antibiotic course to 30 days.
- ^c Levofloxacin or ofloxacin may be acceptable alternatives to ciprofloxacin.
- ^d Rifampin or clarithromycin may be acceptable alternatives to clindamycin as drugs that target bacterial protein synthesis. If ciprofloxacin or another quinolone is used, doxycycline may be used as a second agent because it also targets protein synthesis.
- ^e Ampicillin, imipenem, meropenem, or chloramphenicol may be acceptable alternatives to penicillin as drugs with good CNS penetration.
- ^f According to most experts Ciprofloxacin is the preferred agent for PO prophylaxis.
- ^g 10 days of therapy may be adequate for endemic cutaneous disease. However, a full 60-day course is recommended in the setting of terrorism 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, AGENT, AND DOSAGE ^a
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 or Streptomycin 15 mg/kg IM q12h (max 2gm/day, although only available for compassionate usage and in limited supply is a preferred agent) or Doxycycline 2.2 mg/kg IV q12h (max 200 mg/day) or Ciprofloxacin 15 mg/kg IV q12h or Chloramphenicol ^b 25 m/kg q6H (max 4 gm/day)
	Prophylaxis	Doxycycline 2.2 mg/kg PO q12h or Ciprofloxacin ^c 20 mg/kg PO q12h
Tularemia	Therapy	Same as for plague
Botulism	Therapy	Supportive care, antitoxin may halt progression of symptoms but is unlikely to reverse them
Viral Hemorrhagic Fevers	Therapy	Supportive care, ribavirin may be beneficial in select cases ^d
Brucellosis	Therapy ^e	TMP/SMX 30 mg/kg PO q12h and Rifampin 15 mg/kg q24h or Gentamicin 7.5 mg/kg IM qdx5

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

- ^a In a mass casualty setting, parenteral therapy might not be possible. In such cases, oral therapy (with analogous agents) may need to be used.
- ^b Concentration should be maintained between 5 and 20 mcg/mL; Some experts have recommended that chloramphenicol be used to treat patients with plague meningitis, since 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.
- ^c Other fluoroquinolones (levofloxacin, ofloxacin) may be acceptable substitutes for ciprofloxacin; however, they are not approved for use in children.
- ^d Ribavirin is recommended for Arenavirus, Bunyavirus 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 (maximum dose, 2 gm), then 16 mg/kg IV every 6 hr for 4 days (maximum dose, 1 gm) and then 8 mg/kg IV every 8 hr for 6 days (maximum 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.
- ^e For children younger than 8 years. For children older than 8 years, adult regimens are recommended. Oral drugs should be given for 6 weeks. Gentamicin, if used, should be given for the first 5 days of a 6-week course of TMP/SMX (trimethoprim/sulfamethoxazole).

Table 4. Recommended treatment and management of chemical agents used in terrorism

AGENT	TOXICITY	CLINICAL FINDINGS	ONSET	DECONTAMINATION ^a	MANAGEMENT
NERVE AGENTS					
Tabun, sarin, soman, VX	Anticholinesterase: muscarinic, nicotinic, and CNS effects	Vapor: miosis, rhinorrhea, dyspnea Liquid: Diaphoresis, vomiting <i>Both:</i> coma, paralysis, seizures, apnea	Vapor: seconds Liquid: minutes to hours	Vapor: fresh air, remove clothes, wash hair Liquid: remove clothes, copious washing of skin and hair with soap and water, ocular irrigation	Airway, breathing, circulatory support Atropine 0.05-0.1 mg/kg IV ^b , IM ^c (min 0.1 mg, max 5 mg), repeat q2-5 min prn for marked secretions, bronchospasm, hypoxia, respiratory compromise, apnea, cardiopulmonary arrest Pralidoxime 25-50 mg/kg IV, IM ^d (max 1 g IV; 2 g IM), may repeat within 30-60 min prn, then again q1h for 1 or 2 doses prn for persistent weakness, high atropine requirement Diazepam 0.05-0.3 mg/kg (max 10 mg) IV, lorazepam 0.1 mg/kg IV or IM (max 4 mg), midazolam 0.1-0.2 mg/kg (max 10 mg) IM prn for seizures or severe exposure
VESICANTS					
Mustard	Alkylation	Skin: erythema, vesicles Eye: inflammation Respiratory tract: inflammation, respiratory distress, acute respiratory distress syndrome	Hours Immediate pain	Skin: soap and water Eyes: irrigation (water) <i>Both:</i> major impact only if done within minutes of exposure	Symptomatic care Possibly British anti-lewisite (BAL) 3 mg/kg IM q4-6h for systemic effects of lewisite in severe cases
Lewisite	Arsenical				
PULMONARY AGENTS					
Chlorine, phosgene	Liberate HCl, alkylation	Eyes, nose, throat irritation (especially chlorine) Bronchospasm, pulmonary edema (especially phosgene)	Minutes Bronchospasm: minutes Pulmonary edema: hours	Fresh air Skin: water	Symptomatic care
Cyanide	Cytochrome oxidase inhibition: cellular anoxia, lactic acidosis	Tachypnea, coma, seizures, apnea	Seconds	Fresh air Skin: soap and water	Airway, breathing, circulatory support; 100% oxygen Sodium bicarbonate prn for metabolic acidosis Sodium nitrite (3%): Dosage (ml/kg) Estimated Hgb (g/dl) for average child 10 12 14 Maximum 10 ml Sodium thiosulfate (25%) 1.65 ml/kg (maximum 50 ml)
PULMONARY 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: irrigation (water)	Topical ophthalmics, symptomatic care

^a Decontamination, especially for patients with significant exposure to nerve agents or vesicants, should be performed by health care providers dressed in adequate personal protective equipment. For emergency department staff, this consists of a non-encapsulated, chemically resistant body suit, boots, and gloves with a full-face air purifier mask/hood.

^b Intraosseous route is likely equivalent to intravenous.

^c Atropine might have some benefit via endotracheal tube or inhalation, as might aerosolized ipratropium.

^d Pralidoxime is reconstituted to 50 mg/ml (1 g in 20 ml water) for IV administration, and the total dose is infused over 30 min, or it 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 (1 g added to 3 ml water – by analogy to the Mark 1 autoinjector concentration), to effect a reasonable volume for injection.

Key: Hgb = hemoglobin; prn = as needed

Table 5. Autoinjector Usage

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

Note: 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); 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. 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-1kit only down to age 3 based on adherence to recommended dosages for atropine and pralidoxime. However, if an adult Mark-1kit is the only available source of atropine and pralidoxime following a nerve agent exposure, it should be administered to even the youngest child. In such a situation one should follow weight based dosing guidelines.*

Table 6. Guidelines for KI Dose Administration

PATIENT/AGE	EXPOSURE, GY (RAD)	KI DOSE ^a (MG)
>40 years of age	>5 (500)	130
18-40 years of age	0.1 (10)	130
12 through 17 years of age	0.05 (5)	65
4 through 11 years of age	0.05 (5)	65
1 month through 3 years of age	0.05 (5)	32
Birth through 1 month of age	0.05 (5)	16
Pregnant or lactating women	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

^a Children/adolescents weighing more than 70 kg should receive the adult dose (130 mg).

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

- 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 (eg, raspberry) to the KI/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 Tablet¹¹

- 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 (eg, raspberry) to the KI/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

AGENT	ACTION	DOSAGE ^b
Epoetin Alpha ^a (Epoen, Procrit)	Induces erythropoieses	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)

^a Epoetin Alpha may also be useful to reduce the overall requirements for blood transfusion in any mass casualty incident.

^b 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

ELEMENT	RESPIRATORY ABSORPTION	GI ABSORPTION	SKIN WOUND ABSORPTION	PRIMARY TOXICITY	TREATMENT
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 ₃ to alkalinize urine

NOTES

