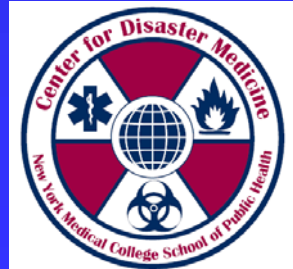


Pediatric Emergency Preparedness Disasters, Terrorism and Public Health Emergencies

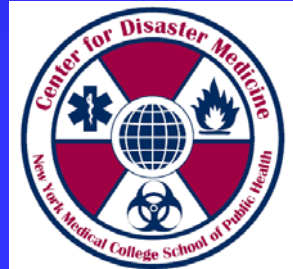
Are We Prepared?

David Markenson, MD
Chief, Pediatric Emergency Medicine
Maria Fareri Children's Hospital
Director, Center for Disaster Medicine
New York Medical College School of Public Health



Basic Questions

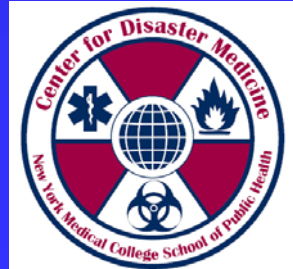
- Are we ready?
- For what?
- How do we prepare?



Do we really need to worry about mass exposure of children to?

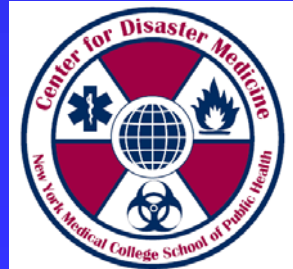
- **Disasters?**
- **Public Health Emergencies?**
- **Terrorism - CBRNE?**

YES



Importance of Pediatric Considerations

- Children are part of the population
 - 26% of the U.S. population are children and youth
 - More than 20 million are under the age of 6 years



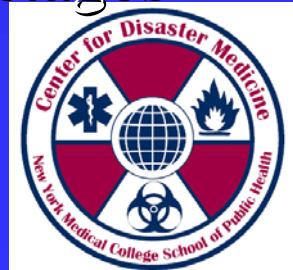
Importance of Pediatric Considerations

- Ignoring children may compromise entire preparedness plan
 - August 2003 Survey
 - 90% nationally and 92% in New York City, reported that they would not comply with an official evacuation order
 - 66 % of the national sample; 62% of New Yorkers listed concern for their children as the main reason



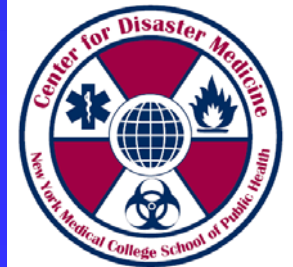
Is there evidence of intention to target children?

- “We have not reached parity with [the Americans]. We have the right to kill 4 million Americans – 2 million of them children...” Suleiman Abu Gheith (2002)
- Singapore government foils al Qaeda connected plan to attack American School (in Singapore) with 3,000 American expatriate children. (CNN, January 2003)
- Russia: terrorists attack a school and take hostages



How children are exposed to CBRNE weapons/agents

- Inadvertently (**Classic Thinking**)
- Intentionally targeted (**New Thinking**)



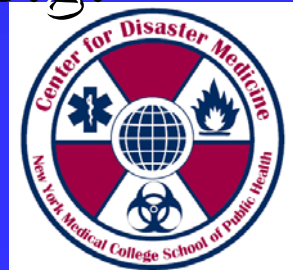
How Are Children Exposed to Chemical, Biological, Radioactive, and Nuclear Agents (CBRNE) Materials?

- **Unintentionally**

- Industrial accidents (e.g., chemical leaks, nuclear reactor accidents)
- Natural disasters
- Airplane crashes

Inadvertently

- As collateral victims of terrorism (e.g. Oklahoma City, Madrid)



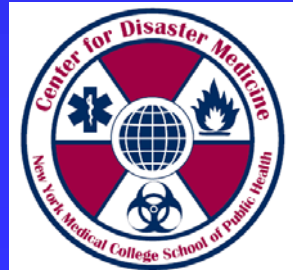
How Are Children Exposed to Chemical, Biological, Radioactive, and Nuclear Agents (CBRNE) Materials?

- **Indirectly**

- Posttraumatic stress (PTSD) and other psychological effects
- Through media (e.g., Oklahoma City, WTC)

Intentionally Targeted

- As victims of terrorist attacks (e.g., Oklahoma, Ma'lot, Beslan)



Where were we in the past?

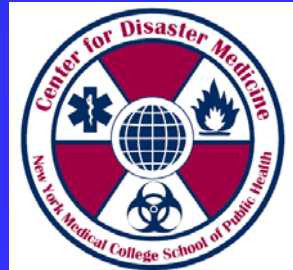


Where are we today?



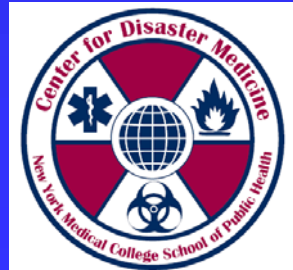
Unique Vulnerabilities of Children to Terrorism and Disasters

- Based on anatomical, physiological and clinical factors
- Due to developmental and psychological concerns
- System issues



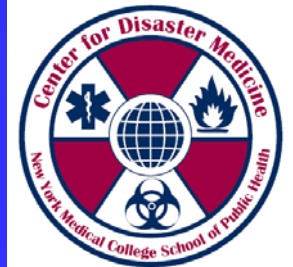
Philosophy of Disaster Medicine When Children are Victims

- Children are more susceptible to certain injuries or environmental insults than adults
- Children with acute injuries or illness are more likely to respond to rapid and efficient medical care than adults
- Since children are not small adults they require equipment and pharmaceuticals designed for their needs



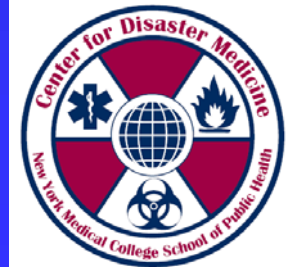
How Children Are Different

- Differences in effects of terrorism and disasters are based on differences due to
 - Development
 - Anatomy
 - Physiology



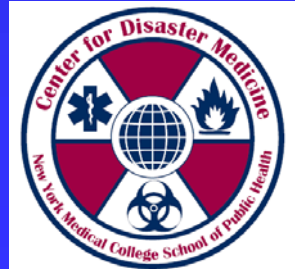
There may be
proportionally...

MORE KIDS THAN ADULTS
THAT ARE SICK



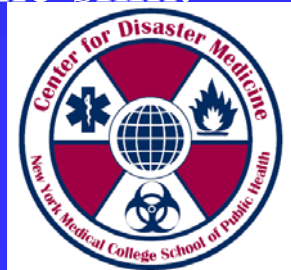
And children may be...

SICKER
THAN THE ADULTS



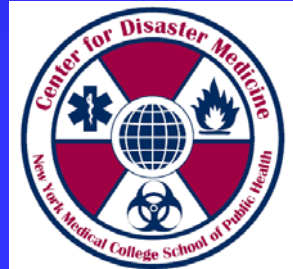
Differences

- Proportionally larger Body Surface Area (BSA)
 - The smaller a patient the greater the ratio of surface area (skin) to size.
 - BSA also parallels certain body functions such as basal metabolic rate and minute volume.
 - **Children may receive a higher per kilogram dose of agents absorbed through the skin**
- Thinner skin
 - Thinner epidermis
 - Under-keratinized epidermis
 - **Children may be more susceptible to agents either effecting the integrity or absorbed through the skin.**



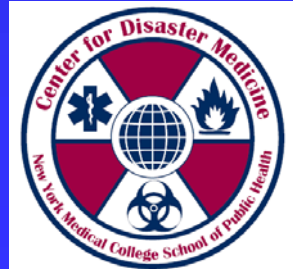
Differences

- Children have more rapid respiratory rates
 - Proportionally higher Minute Volumes and more rapid exposure to inhalational agents
- The breathing zone in children is closer to the ground
 - Many agents that are aerosolized are heavier than air: higher concentration lower to the ground
 - **Children may be more susceptible to agents absorbed through the pulmonary route than adults with the same exposure**
 - **Children may show early effects to agents absorbed through the pulmonary route than adults with the same exposure**



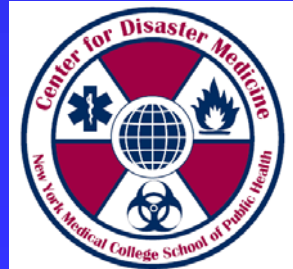
Differences

- Prevalence of neurological symptoms
 - Immature blood –brain barrier
 - Enhanced CNS receptor sensitivity
 - **Nerve agents may produce more symptoms in children requiring treatment than adults with the same exposure.**
 - **Agents may have CNS effects in children that do not have CNS effects in adults or at lower exposures than adults**



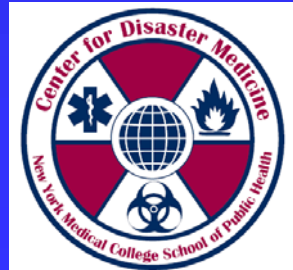
Differences

- Children are more prone to dehydration than adults
 - Many of the chemical agents and some of the biological lead to vomiting and diarrhea
 - **Children may be more symptomatic and show symptoms earlier than adults**



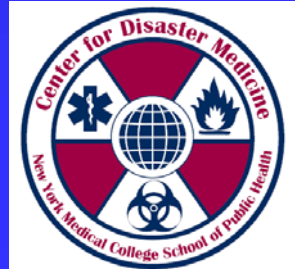
Differences

- Children are more prone to ionizing radiation
 - Main effect of ionizing radiation: effects on rapidly growing tissues
 - **Children may be more symptomatic and show symptoms earlier than adults**
 - **CNS – may only see effects in children at certain doses**
 - **Bone Marrow – more symptomatic than adults**



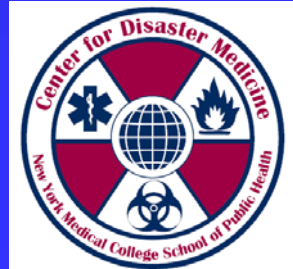
Children may present with...

Different disease manifestations



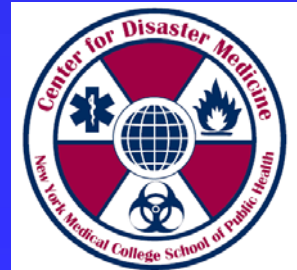
Differences

- Different disease presentations
 - Smallpox: lack of immunity
 - Trichothecene: more susceptible ?
 - Melioidosis: unique parotitis
 - Anthrax: ?? Less susceptible
 - **Children may be affected differently by biologic agents and the presentations may be different**



Children can be...

MORE CHALLENGING
TO CARE FOR



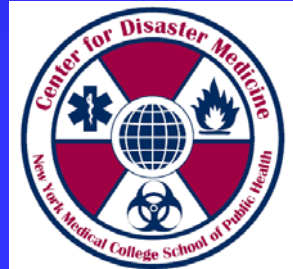
Differences

- Difficult vascular access.
 - The problems with managing the many size-related issues in an acute emergency.
 - The smaller the patient the more difficult is vascular access.
 - The varying sizes cause error, delay, and discomfort in drug dosing.
 - **e.g.: Medications via IM and IO route may of practical value in a mass casualty situation.**



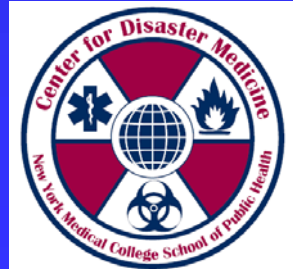
Children may require...

MORE RESOURCES



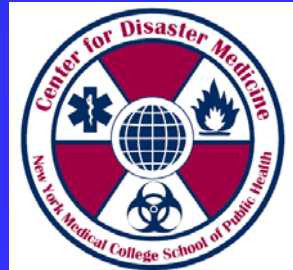
Differences

- Developmental/Psychological Immaturity
 - Lack of comprehension of situation
 - May go towards danger because it is interesting
 - Cannot follow group directives
 - Group decontamination may not be feasible
 - Need continuous psychological support
 - **Need more resources/personnel to care for children.**



Differences

- Children with Special Health Care Needs and Technologically dependant children
 - Survival may be based on ventilators, IV nutrition, etc...
 - **Will require stockpiling of equipment and medications specific to children**



Children may require...

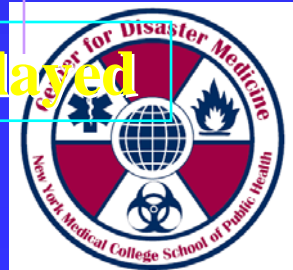
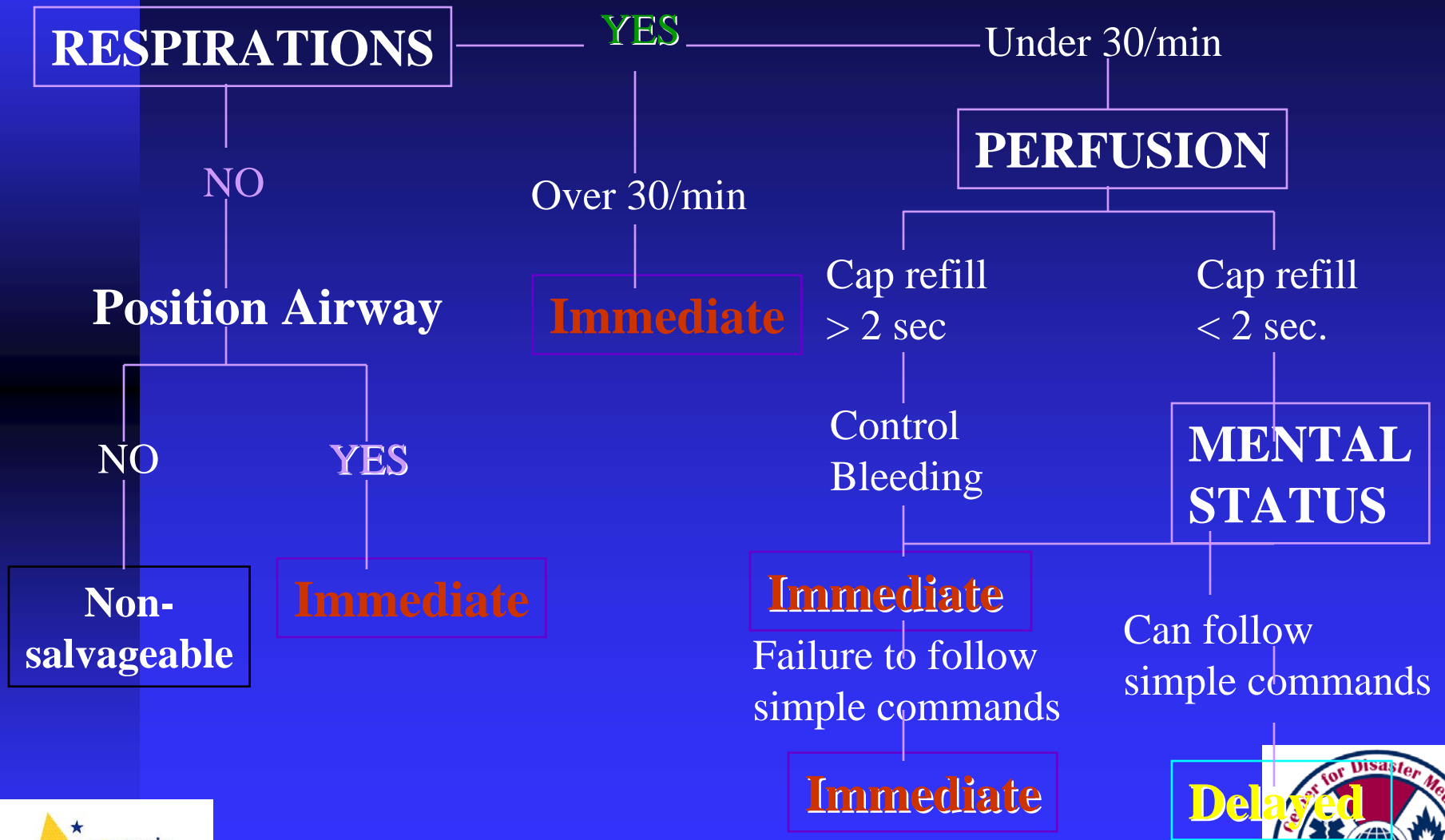
DIFFERENT RESOURCES



Triage?



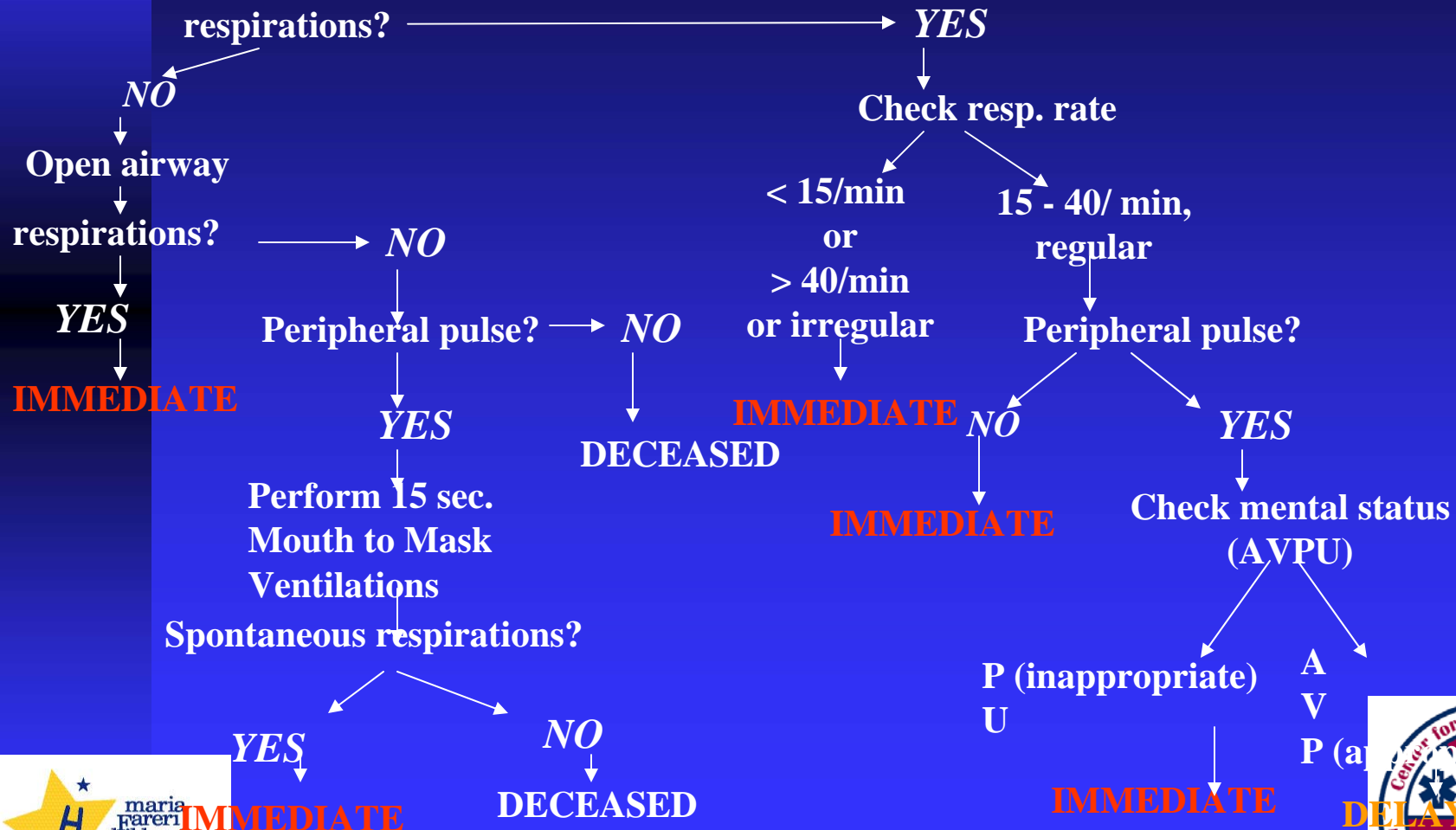
START Triage



The JumpSTART

Field Pediatric Multicasualty Triage System ©

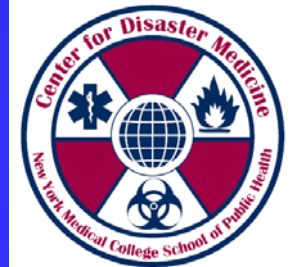
(Patients aged 1- 8ears)



© Edna Romig, MD, PhD, FACEP, 1995



What are some of the key gaps?



Identification and Reunification

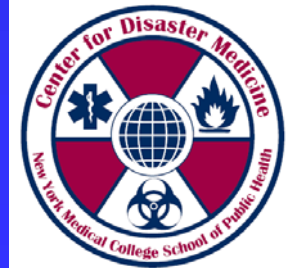


Identification and Reunification of Children After a Mass Casualty Incident

- Requires means of rapidly collecting information on arriving casualties (e.g., digital photos)
- Photo indexing
- Site where arriving parents can review photos
- System for presenting select photos

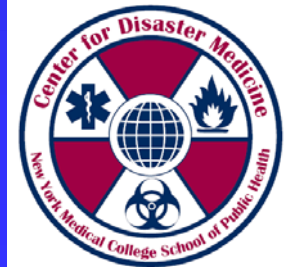


Sheltering



Pediatric Sheltering Issues

- Is it child safe?
- Who will supervise the children?
- Does the shelter have the correct equipment
- Can families stay together?



Pediatric Shelter Considerations

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

Appropriate hygiene/waste disposal resources

Basic health screening to ensure appropriate levels of available care

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

Security of unattended or unsupervised minors

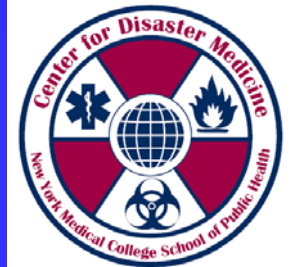
Availability of medical information resources (computers, posters, phone referral lines, etc) to aid in appropriate use of medical resources

Standardized health care data collection

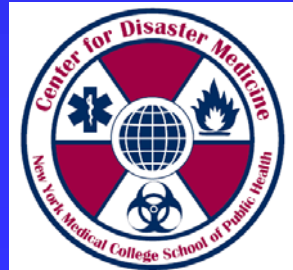
Environmental considerations (smoking, alcohol, other drugs, weapons)

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

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

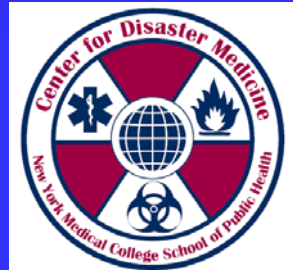


Surge Planning



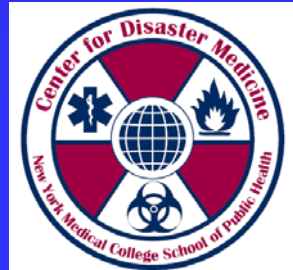
What is Pediatric Surge?

- Secondary Victims
 - Proportion of normal census
- Uniquely Pediatric Event
 - Out of proportion to normal census
 - School, day care, school bus, camp
- Family Unit
 - Ability to care for family without separating children and adults



Pediatric Surge Planning

- Address pediatrics out of proportion to normal numbers
 - Emergency Operations Plans
 - Providers
 - Equipment, pharmaceuticals
 - Drills and exercises
- Plans for care of children
 - Adult Providers
 - Adult Units
 - Adult Equipment
- Plans for care of adults in pediatric units



Pediatric Resources

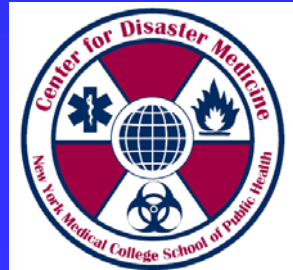


Pediatric Specific Resources

- Providers
- Medications
- Equipment
- Triage
- Treatment Protocols



Decontamination



Example: The Chemical Contaminated Casualty



Contaminated Casualty Victims

Current Status

- Most Hospitals Have Minimal Decontamination Capability
- HazMat Teams Are Supposed to Decontaminate Patients at the Incident Site
- Decontaminated Patients Then Transported to Health Care Facilities for Treatment
- No Contaminated Patients Are Expected to Arrive at the Hospital



Tokyo March 20, 1995

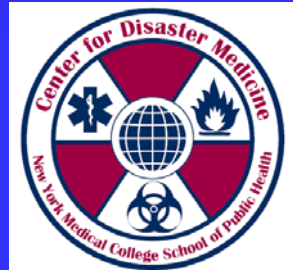
- 5,500 People Exposed
- 3,227 Went to Hospital
- 550 Transported Via EMS
- Essentially no Decontamination of Patients



Tokyo Sarin Attack

Sarin Secondary Contamination

- 11 ED physicians were affected by Sarin carried into the ED by victims
- Once the victims were forced to remove their clothing before entering the ED, no further ED staff affected



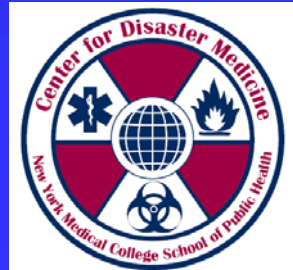
What about pediatric decontamination? Where does an infant go?



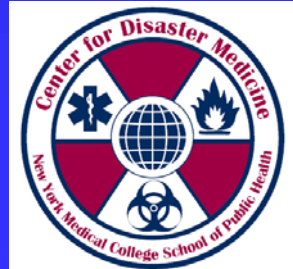
Decontamination

Pediatric Considerations

- Water pressure
 - Will it injure a child?
- Water temperature
 - If water is not warm: may cause hypothermia
- Non-ambulatory child
 - Infants, toddlers
 - Children with special healthcare needs
- Mental health concerns
 - Will children follow instructions
 - Long term effects



WMD Antidotes



Mark-1 Auto-Injector

- Standard antidote for nerve agent exposure
 - Deployed in most hospitals and EMS systems
- What about children?
 - Manufacturer makes pediatric model for Israel and other countries
 - Not FDA approved
 - Dosage is safe for most children based on data from organophosphate poisoning



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

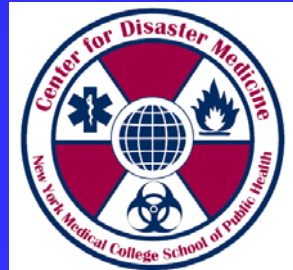
Note: Each Mark 1 kit contains two autoinjectors (0.8 inch needle insertion depth), one each of atropine 2 mg (0.7 ml) and pralidoxime 600 mg (2 ml); while not approved for pediatric use, they should be used as initial treatment in circumstances for children with severe, life-threatening nerve agent 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.



Pediatric Dosage AtroPen®

Key Points

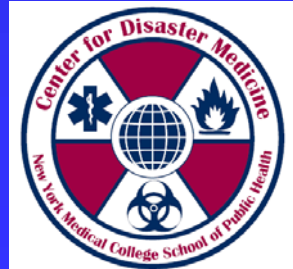
- AtroPen® is **only** ½ of a Mark-I Kit
 - Does not include pralidoxime.
 - Pralidoxime should be added for appropriate treatment of nerve agent exposure.
 - Complete treatment will require the usage of anticonvulsants
 - Creates operational issues



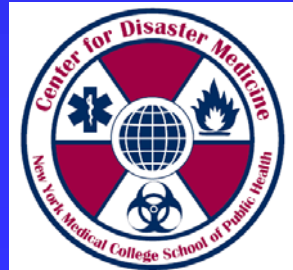
AtroPen Recommendations

The Mark 1 Kit should remain as the preferred emergency treatment for children of any age.

This recommendation includes using the Mark 1 Kit in children younger than 3 years old after bona fide nerve agent exposure.



School Planning



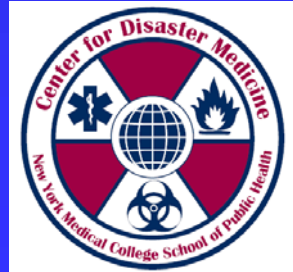


Preparedness & The Schools

- Preparedness planning
- Coping and resiliency issues for teachers and students
- Special issues: KI, what to stockpile, syndromic surveillance
- Communications with parents



Questions?



Key Reference Web Sites

- Know your resources:
 - Center for Disaster Medicine
 - www.nymc.edu/cdm
 - AAP
 - www.aap.org/terrorism
 - CDC
 - www.bt.cdc.gov
 - ARC
 - www.redcross.org

