



California Association of Neonatologists

Neonatal Disaster Preparedness Toolkit

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California Association of Neonatologists (CAN) Neonatal Disaster Preparedness Toolkit

TABLE OF CONTENTS

Preamble.....	3
Part I: Introduction to the Hospital Incident Command Center (HICS).....	5
Part II: Six Critical Elements of Disaster Response.....	8
Part III: The Hazard Vulnerability Analysis.....	12
Part IV: Specific Hazards.....	15
A. Natural Disasters.....	15
Table 4A: Patient and Staff Support Supplies.....	18
Table 4B: Go-Kit Contents.....	19
B. Human Incidents.....	21
C. Infrastructure Failure.....	31
D. HAZMAT Accidents.....	42
Part V: TRAIN© (Triage by Resource Allocation for IN-patients).....	45
Table 5A: TRAIN© Assignment Grid.....	46
References.....	48
Appendices.....	50
Appendix A: NICU Disaster and Evacuation Protocol, Good Samaritan Hospital, San Jose, CA.....	51
Appendix B: Job Action Sheets/Cards – Master List.....	60
Appendix C: Bioterrorism Treatment Response Guidelines.....	68
Appendix D: Pre-Disaster Critical Infrastructure Self-Assessment.....	99

Preamble

Neonatal - Perinatal patients have unique needs that distinguish themselves from most other hospitalized patients. NICU patients are highly dependent on hospital staff for all aspects of their care. Many are critically ill and are heavily dependent on advanced technology for their survival. Any number of disasters has the potential to impact on a NICU's ability to care for their patients. The intent of this Tool Kit is to provide guidance to NICU leadership in developing comprehensive disaster response plans that are in compliance with Joint Commission Standards and based on community, best-practice models.

The Joint Commission provides detailed guidance on the requirements for disaster preparedness in accredited hospitals. The following elements are required (Standard EM.01.01.01; See the Joint Commission E-edition, Hospital Standards on Emergency Management, www.jointcommission.org/standards_information/edition.aspx)

- Leaders, including those of the medical staff, actively participate in emergency planning
- A hazard vulnerability analysis (HVA) is conducted to identify events that could affect demand for services or ability to provide services
- In coordination with community partners, hazards identified in the HVA are prioritized
- Organization needs and vulnerabilities and community capabilities are communicated to regional emergency response agencies
- The organization develops mitigation, preparedness, response and recovery strategies for each identified threat in the HVA
- The organization maintains an inventory of assets and resources available during an emergency

Clearly, the majority of such planning will occur at the executive level of hospital leadership and is beyond the scope of NICU leadership to implement independently. However, it is critical that NICU leadership ensure that such planning does not ignore or overlook the unique needs of the highly vulnerable NICU patients. NICU leaders should be cognizant of their organization's Emergency Operations Plan and its Incident Command System. They must be knowledgeable of where the NICU falls in the communication and response chain of command and understand the expected staff roles and responsibilities during a disaster. Finally, NICU leadership is advised to conduct their own HVA to identify threats that can be planned for and mitigated against

at the NICU level. In developing a NICU specific emergency response plan, NICU leaders should collaborate with Obstetric leadership to ensure vulnerable Obstetric patients continue to have NICU support in the event of an emergency.

This tool kit will:

- Introduce NICU leadership to the Hospital Incident Command System
- Describe the principles of conducting a Hazard Vulnerability Analysis and how to apply the information generated at the NICU level
- Identify major hazards faced by NICUs in California and provide suggested mitigation and response planning strategies
- Provide an appendix with sample check lists, job action sheets, and information transfer sheets for specific hazards, as well as references for further training

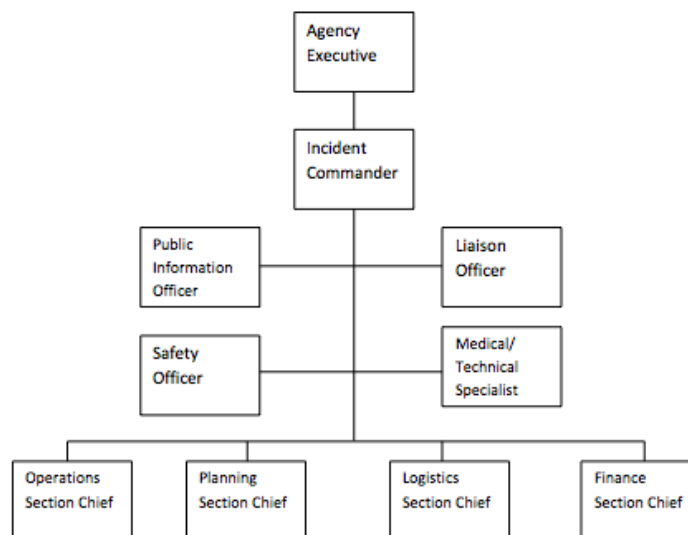
Part I: Introduction to the Hospital Incident Command Center (HICS)

The following is a brief introduction to the Hospital Incident Command System (HICS) and is intended to give NICU leadership a general understanding of this organizational structure. The reader is directed to the FEMA IS-100.HC online course (<http://emilms.fema.gov/IS100hcb/index.htm>) for a more in depth indoctrination to the principles of HICS. NICU leaders are also urged to review their own institution's Emergency Operations Plan (EOP) to understand where their NICU fits in their hospital's chain of command.

The Joint Commission Standard EM.02.01.01 states that each organization must maintain an EOP. In addition, the EOP must establish an incident command system for emergency management. Several incident command models exist and the EOP standard does not stipulate a specific system. HICS is widely used and is the system endorsed by CAN. HICS complies with The Joint Commission standard and is the product of 30 years of best practices and lessons learned.

The HICS structure is modular and flexible. It can be expanded or contracted and will adapt to large and small events. Several basic principles apply throughout the organizational structure:

- Chain of Command: There is an orderly line of authority within the ranks of the organization
- Unity of Command: Every individual in the organizational structure is accountable to only one designated supervisor
- Span of Control: Each supervisor is limited to 3-7 subordinates
- The basic leadership roles and their respective relationships are presented:



Agency Executive

- Organization CEO or equivalent
- Delegates responsibility of incident response to Incident Commander

Incident Commander

- Has overall responsibility for the incident response
- Sets objectives
- Public Information Officer, Safety Officer, Liaison Officer and Section Chiefs report directly to Incident Commander

Public Information Officer

- Conduit for incident information to all internal and external stakeholders, including the media

Safety Officer

- Responsible for safety of all organization personnel

Liaison Officer

- Point of contact for supporting agencies

Operations Section Chief

- Conducts tactical operations

Planning Section Chief

- Prepares Incident Action Plan
- Collects and evaluates information
- Maintains resource status and documentation

Logistics Section Chief

- Provides support and resources to meet incident objectives

Finance Section Chief

- Provides accounting, procurement, time recording and cost analysis

Med/Tech Specialists

- Individuals within an organization with an area of expertise that is critical to a specific incident response. Med/Tech Specialists can be assigned to any part of the HICS structure including reporting directly to the Incident Commander.

Neonatal Intensive Care Unit

- Understanding the expectations of the NICU and its staff as stipulated in each institution's EOP is a critical responsibility of the NICU leadership.
- The Senior NICU leadership may also be assigned as Med/Tech Specialists when neonates are directly impacted by the incident.

The Joint Commission requires at least two activations of the EOP per year (Standards EM.03.01.01 and EM.03.01.03). These can be through live exercises or during actual incidents. Exercises provide opportunities for NICU leadership and staff to review their roles and responsibilities under the EOP and HICS, to test equipment that might be used during an actual disaster, and to test specific NICU response plans as they apply to the exercise scenarios.

Part II: Six Critical Elements of Disaster Response

The Joint Commission has determined six critical areas of emergency response. These areas have been identified after reviewing lessons learned from healthcare organizations impacted by large-scale disasters. Planning and responding to disasters requires that organizations have a sound response plan to each of these areas.

Communication

- Organizations must develop a plan to maintain communication pathways both within the organization and with critical community resources.
- Communication needs to be standardized both internally and externally. The National Incident Management System (NIMS) is recommended to ensure standardized communication across the organization and the community.
- Plans for maintaining communication must include the following:
 - Notification of staff that emergency response procedures have been initiated
 - Communicating information and instruction to medical staff and licensed independent practitioners during an emergency
 - Notification of external authorities that emergency response measures have been initiated
 - Communication with external authorities during an emergency
 - Communication with patients and their families
 - Communication with the community or media
 - Communication with suppliers of essential services, equipment and supplies
 - How and under what circumstances the organization will communicate with other healthcare organizations in the contiguous geographic area regarding:
 - Structure and roles of the various organizations
 - Resources and assets that could be shared
 - Names of the patients and the diseased
 - How the organization will communicate information about patients to third parties

- How the organization will communicate with identified alternative care sites
- Back-up communication systems: telephone and cellphones may fail in a disaster situation. Contingency plans for back-up communication should include systems for internal as well as external communication. Options may include two-way radios, pagers, broadcast radio, television, satellite, fax machines, internet, public address system and intercom.

Resources and Assets

The organization must consider what items will be needed to adequately care for patients. Plans must take into account the risk that some assets might not be available.

- Obtaining and replenishing patient care supplies. Common supplies needed during a disaster include stretchers, IV supplies, oxygen, cardiac monitors, blankets, and pharmaceuticals.
 - Staff support activities
 - Housing, food, water
 - Staff transportation
 - Crisis Counseling
- Family needs
- Sharing resources:
 - Identify vendors outside of region in case the disaster is spread throughout the local region.
 - Establish MOUs and means of communication with other nearby centers for sharing of resources.

Managing Safety and Security

- Coordinating with security agencies:
 - Incorporate local police departments.
 - Identify the capabilities of additional community resources assuming police departments may not have capacity during disasters.

- Managing hazardous materials and waste: (medical waste, e.g., sharps, gases)
- Controlling the facility:
 - Determine the types of access and movement to be allowed (staff, patients, families, visitors, emergency volunteers, vendors).
 - Have procedures for identifying authorized care workers and other personnel.
 - Prevent entry of authorized personnel into damaged area.
 - Traffic control for arrival/departure of emergency vehicles

Manage Staff Roles and Responsibilities

- Define roles and responsibilities in EOP.
- Provide training for staff.
- Create quick reference safety manuals and guides.
- Identify and assign staff members to cover all essential staff functions under emergency conditions. Determine availability of staff in advance and how quickly they can respond.
- Plan for adequate food, housing, transportation and crisis counseling for staff.
- Teach staff how to manage stress.
- Plan for staffing beyond immediate 24 hour (e.g., relief crews, housing).

Managing Utilities

- Identify alternative means for providing:
 - Electricity
 - Water needed for consumption and essential care activities
 - Water needed for equipment and sanitary purposes
 - Fuel required for building operations and essential transportation

- Medical gas/vacuum systems

Clinical and Support Activities

- Personal hygiene and sanitation needs
- Documenting and tracking clinical information when utilities and communication are interrupted
- Additional clinical needs specific to NICU patients

Part III: The Hazard Vulnerability Analysis

The Joint Commission requires each institution to conduct an annual Hazard Vulnerability Analysis (HVA). This allows organizations to identify likely threats and analyze the degree to which the organization is prepared to respond to those threats. While the HVA is typically done at the Hospital leadership level, an HVA can be useful for NICUs in planning specific hazard response plans.

The basic elements of an HVA start with a brain storming session. All suggested hazards are included for analysis. It may be useful to group hazards to facilitate the brainstorming session. Examples include: Natural Disasters, Human Incidents, Technological Crises, and Hazardous Material Accidents. The identified hazards are then ranked using estimates of probability, risk, and preparedness. Rankings are then used to guide response planning and exercise priority.

Probability - Known risks, historical data

Risk - Threat to health/life, disruption of services, damage to facility, financial impact, legal issues, and community trust

Preparedness - Current plans, training, insurance, back-up systems, community resources

Each category is ranked with a numeric severity score. (See **Modified CAN HVA*** below for an example.) These scores are then multiplied to generate a total ranking score.

Ranking Score = Probability x Risk x Preparedness

The CAN task force conducted an HVA to identify and rank the major hazards that might impact on California NICUs. Due to California's large size, it is impossible to generalize all hazards to all state NICUs. When reviewing this list, NICU leadership should consider their NICU's geographic footprint in the community, their location within the hospital and their local and regional relationships with other health care services and NICUs. The modified HVA conducted by the CAN task force evaluated only probability and severity, as assessing preparedness of each NICU was not possible. Each CAN task force member scored each hazard and multiplied the probability and severity scores. The scores were then averaged to rank the identified hazards.

For Probability Scores:

4 - High probability statewide

3 - High probability in specific regions or moderate probability statewide

2 - Moderate probability in specific regions or low probability statewide

1 - Low probability in specific regions

0 - Virtually no chance of occurrence

For Severity Scores:

5 - Severe and direct impact on NICU

4 - Severe and direct impact on hospital with indirect impact on NICU

3 - Moderate direct impact on NICU

2 - Moderate indirect impact on NICU

1 - Mild to no impact on NICU

The task force identified the following hazards and these are presented in rank order. This is not meant to be an all-inclusive list and serves only as a starting point for NICU leaders in developing their own response plans. While it is acceptable to use this list as it is, NICU leaders are encouraged to review their own institution's HVA and ensure the NICU needs have been addressed. The following sections of the tool kit will discuss specific hazards and present planning and response guidelines for each.

***Modified CAN HVA:**

Natural Disasters:

- Earthquakes
- Wild Fires
- Dam/Levee Breach
- Extreme Temperature
- Floods
- Tsunami
- Drought

Human Incidents:

- Pandemic
- Bio-terrorism
- Terrorism
- Bomb Scare
- Region Wide Bed Shortages

- Violent Visitor
- Active Shooter
- Infant Abduction
- Labor Dispute

Infrastructure Failure:

- Computer Failure
- Power outage
- Med Gas Outage
- Plumbing Breech
- Water Outage
- HVAC failure
- Wall Suction Outage

Hazardous Material Accidents:

- Industrial Spill
- Chemical Fire
- Radioactive Material Accident

Part IV: Specific Hazards

A. Natural Disasters

Natural Disasters include the following events: earthquakes, tsunamis, wildfires, external temperature, landslides, weather events (tornadoes, hurricanes and blizzards), volcanic activity, floods and drought. Most involve loss of power, interruption of outside communication and may include some degree of damage to the building such as broken windows and fallen objects from cabinets and shelves. All natural disaster response plans ultimately require planning for standalone capability, staffing shortages and possible evacuation.

Staffing

Staffing can often be a top priority. Staff may be unwilling or unable to report for work if their homes are damaged, childcare arrangements are affected or the transportation systems are incapacitated. In the case of acute emergencies, there may be a full complement of staff but finding relief is difficult. Arrangement for food, water and personal supplies to support the staff is especially important in these situations.

- **Surge Capacity:**
 - **Internal Augmentation:** In the event of staffing shortages, NICUs may need to pull staff from other wards. Ideally, such staff should come from the PICU, Mother-Infant wards or Pediatric wards. Keep in mind that these units will likely be short staffed as well and you may need to supplement NICU staff with less experienced personnel from other parts of the hospital, including outpatient clinics.
 - **Volunteer Staff:** Volunteer staff will need to be vetted via the hospital emergency credentials plan and given temporary ID before being allowed to work in the unit.
 - **Treatment Teams:** All supplemental staff should be paired with NICU staff for supervision and guidance. They should be assigned lower acuity patients. When high numbers of supplemental staff are required, treatment teams can be created with a NICU staff supervisor for each team. These principles can apply to Nurse, RT and Physician/Nurse Practitioner teams.
- **Staffing Ratios:** It may not be possible to preserve standard nurse-patient ratios during a widespread disaster, even with the help of volunteers and supplemental staff. The needs of the patients will require temporarily exceeding these nurse-patient ratios until additional staff is available or evacuation is ordered.

Evacuation

When the infrastructure of the hospital is compromised and patients are in danger or when standalone capabilities are exhausted, it may become necessary to evacuate patients to a safer area. However, an evacuation is a very challenging and high-risk activity for the NICU. Thus, special consideration must be given to planning for this particular response procedure. For an emergency evacuation of the NICU to be effective, it would require the coordination of all staff members, the rapid mobilization of equipment and a flexible evacuation response plan (See **Appendix A - NICU Disaster and Evacuation Protocol**, Good Samaritan Hospital, San Jose, CA.)

Careful consideration must be given to establishing clear roles and responsibilities, rehearsing these roles and ensuring quick and easy access to emergency equipment, supplies and documentation forms.

- **Types of Evacuation:**
 - **Horizontal:** Internal evacuation from impacted area of hospital to designated safe zone within the hospital (same floor)
 - **Vertical:** Internal evacuation from impacted area of hospital to designated safe zone within the hospital (different floor)
 - **External:** Evacuation to an outside facility
- **Priority:** The type and destination of the evacuation will depend on patient acuity and type of emergency. Evacuations will be directed by the Incident Commander via the Hospital Command Center (HCC) and will be coordinated with regional Offices of Emergency Services (EMS). The NICU EOP should specify the safest locations for horizontal (same floor, different fire zone), vertical (different floor), as well as in-hospital or out-of-hospital staging locations. When evacuating an entire hospital, the sequence of evacuation usually begins on the ground floor, working upward. When time allows, the most critical patients are usually evacuated first. Availability of ambulance assets and regional bed availability may affect evacuation priority. There may be circumstances when the sequence of evacuation focuses on saving the greatest number of lives in a short amount of time. In this case, the decision is often made to evacuate lower acuity patients first. This may be deemed necessary when patients are in immediate danger or building structure is clearly compromised (Zane, et al 2010).
- **Evacuation Procedures:** Procedures will differ depending on the type of evacuation. For example, a great deal of equipment can be mobilized during a horizontal evacuation. However, equipment such as isolettes, ventilators and monitors would most likely be left behind in the event of a vertical

evacuation. The procedure for evacuating the NICU and methods for continuing to provide various types of respiratory support, hydration and thermoregulation must be outlined in the evacuation response procedure and the staff must be trained accordingly. The following considerations are listed to facilitate a safe evacuation of the NICU (Frank, Epstein and Adams, 1993):

- More than one staff member may be needed to evacuate infants requiring oxygen support.
- Self-inflating Ambu bags may be used to deliver manual breaths to infants.
- High-flow nasal cannula may be considered for infants receiving Continuous Positive Airway Pressure (CPAP).
- Methods for portable suction should be available for use in evacuation.
- IV infusions may be stopped, temporarily, for the purpose of evacuation.
- Portable IV and/or medication pumps may be used to provide hydration for NPO infants.
- Intermittent infusions of fluids may be necessary, if no pumps are available.
- Infants may be double-wrapped with hats to provide warmth.
- Chemical warming mattresses may be used to prevent hypothermia.
- To address a potential evacuation of the NICU, a list of critical evacuation equipment must be compiled. Since those who respond to help in an emergency may be labor pool employees or outside emergency responders, it is wise to have photos of each piece of equipment to aid in equipment identification and a more rapid response.
- Finally, guidelines that detail procedures for providing routine and emergency care during and after evacuation must be evaluated and included in the EOP.

- **Necessary Supplies for Safe Evacuation (Phillips et al, 2012):**

- **Emergency Bedside Supplies:** The availability of appropriate and adequate supplies is important for timely emergency response efforts. The Emergency Operations Plan (EOP) should specify that these

be assembled and stored at or near each patient's bedside so they can accompany the patient during the evacuation process. The goal of these supplies is to enable staff to provide routine assessments, respiratory care, nutritional support and thermoregulation for twelve hours in the event of an emergency. A sample supply list for NICU patients is provided in **Table 4A, Patient and Staff Support Supplies**. Backpacks or soft-sided travel bags provide a convenient means of storing these supplies and can be easily moved with the patient.

Table 4A: Patient and Staff Support Supplies
Emergency Bedside Supplies
Resuscitation:
- Bag/mask, bulb syringe, Heimlich v.
Assessment:
- Stethoscope, pen/paper, watch
Thermoregulation:
- Thermal blankets, chemical warming mattress, cap
Feeding/changing:
- Formula/nipples, diapers/wipes, gavage supplies
Hand hygiene:
- Alcohol gel, sterile gloves, alcohol wipes, saline wipes
General Support:
Diapers
Breastfeeding supplies for pumps, etc.
IV supplies
Bulb syringes
Mobile Disaster Boxes:
Headlamps
Intubation
Suction
IV start supplies
IV fluids
Calculator
Scissors
Staging Area Supplies:
Ventilators
Suction machines
Food and water for staff
Nutritional supplies for patients

- **Mobile Disaster Containers:** During an emergency or loss of utilities, some infants may need more invasive basic procedures. Thus, a list of medical supplies that would be needed for intubation and intravenous access should also be created. (See **Table 4A.**) These supplies are assembled and stored in a mobile container located in a convenient location that serves the entire NICU or multiple containers, one for each NICU area, should be available for quick and easy access.
- **NICU Disaster Documentation and Forms Go-Kit:** To facilitate the quick mobilization of necessary guidelines, forms and paperwork, a NICU Disaster Documentation and Forms Go-Kit (**Table 4B, Go-Kit Contents**) should be created for the unit. The typical Go-Kit is a plastic file with dividers that contain documents such as the unit's EOP, emergency response procedures specific to the NICU, HICS forms, emergency contact information and computer downtime charting forms. An important component of the NICU Disaster Documentation and Forms Go-Kit is unit-specific Job Cards, which utilizes common terminology and mirror NICU Job Action Sheets. These quick reference cards can be color coded and laminated to simplify the actions required by each job classification in checklist format. These durable and waterproof cards are clearly visible at the bedsides that are often cluttered with white papers and allow staff to quickly identify and focus on prioritizing duties and rapid mobilization of resources.

Table 4B Go-Kit Contents:
Job Action Sheets
Phone numbers (internal, external, staff)
Critical equipment photos
HICS Form 214, 255, 260
Hospital Emergency/Disaster Status Report Form
Drill Critique Form
Bedside operational forms (kardexes, MARs, consents, orders, progress notes specimen slips, transport papers)
Office supplies: pens, pencils, clipboard)

Roles and Responsibilities

In addition to the Hospital Command Center roles, each unit must identify and define roles and responsibilities for key staff positions that may be needed to respond to emergencies. These roles are created as Job Action Sheets (**See Appendix B, Job Action Sheets/Cards – Master List**) utilizing the HICS and outlined concisely using common terminology. In addition, staff must receive training to rehearse their roles and

responsibilities at staff meetings, departmental workshops and periodic drills and exercises. The HICS positions that may be activated within the NICU and those who are capable of assuming those roles include:

- Physician Unit Leader (Neonatologist)
- Inpatient Unit Leader (Charge Nurse)
- Bedside Nurse Room Leader (RN)
- Bedside Nurse (RN)
- Logistics Unit Leader (Relief/Transport RN)
- Respiratory Unit Leader (Respiratory Therapist)
- Unit Clerical Leader (Secretary/Unit Clerk)

Emergency Medication Administration

Since medication administration is a key component of care in the NICU, it is essential to incorporate planning for pharmaceuticals in the hospital EOP. In the NICU, this may include medications designated for transport or medications ordinarily located in code carts. In addition, the hospital pharmacy must create an EOP that addresses the need to provide medications for hospitalized patients in case of emergency. The pharmacy must stock, inventory and prepare lists of medications most commonly used in units, including the NICU. These medications are to be utilized when resources become scarce as part of the hospital's emergency planning efforts.

Transport

In the event of an emergency or disaster, alternative arrangements for transport of infants to other hospitals must be considered. Prioritizing ambulance assets is paramount to successful movement of patients from one facility to another (see section on TRAIN and triage). Establishing community relationships and mutual aid agreements to ensure the ability to reliably and safely transport infants to a safer location for care is important in preparedness efforts. Guidelines for transporting infants to other hospitals are discussed in the EOP and the documentation and consent forms required for transport are readily available in the NICU Disaster Documentation and Forms Go-Kit for easy access.

Part IV: Specific Hazards

B. Human Incidents

Bio-terrorism

There are numerous microorganisms that are potentially weaponizable. The CDC lists three categories of biological agents. Examples of each category are listed. It is beyond the scope of this toolkit to list all possible bio-weapons or provide the most up to date treatment recommendations. General response guidelines for Category A and selected Category B organisms are included in **Appendix C, Bioterrorism Treatment and Response Guidelines**. Resources for the most up to date and detailed treatment guidelines are listed below. **Always** refer to these agencies for the most current guidelines in the event of an actual biological catastrophe.

In many cases, the treatment of choice for a given weaponized microorganism will be an antibiotic not recommended for small children and pregnant women. Examples are: Ciprofloxacin, doxycycline, tetracycline and ribavirin. In cases of a biological attack, the theoretical risks of the drug of choice needs to be weighed against the fatality and morbidity risks of not treating or providing prophylaxis. In most cases, treatment would be recommended for small children or pregnant women despite the potential side effects of the drug. If there is a suitable substitute drug, that drug should be given. Otherwise, proceed as with older or non-pregnant patients.

Category A: High potential for large scale dissemination and high mortality rates

- Anthrax (**Appendix C, pg. 69**)
- Smallpox (**Appendix C, pg. 96**)
- Plague (**Appendix C, pg. 89**)
- Tularemia (**Appendix C, pg. 101**)
- Botulism (**Appendix C, pg. 72**)
- Viral Hemorrhagic Fevers (**Appendix C, pg. 81**)
- Ebola (**Appendix C, pg. 77**)

Category B: Moderate dissemination potential with moderate morbidity and low mortality

- Q fever (**Appendix C, pg. 92**)
- *Brucella* (**Appendix C, pg. 75**)
- *Burkholderia*
- Alpha viruses
- Typhus
- Psittacosis

- Water borne illness (*Salmonella*, *Shigella*, *E. coli* o157:H7, *Cholera*)
- Biological toxins and Ricin (**Appendix C, pg. 94**) and *Staphylococcus* enterotoxin B (**Appendix C, pg. 99**)

Category C: Emerging pathogens

- Nipah virus
- Hanta virus
- Tick-borne pathogens

In the event of such a catastrophe, the CDC, CALHAN and Regional Public Health Departments will likely issue response guidelines. Consultation with the institution's Infectious Disease, Preventive Medicine and Infection Control experts will be essential. Available resources include:

Center for Disease Control (CDC)

Phone: 770-488-7100

Website: www.cdc.gov/mmwr/international/relres.html

<http://emergency.cdc.gov>

US Army Medical Research Institute of Infectious Disease (USAMRIID):

Phone: 888-872-7443

Website: www.usamriid.army.mil/

US Department of Health and Human Services Public Health Emergency:

Website: www.phe.gov/emergency/pages/default.aspx

American Academy of Pediatrics bioterrorism information:

Website: www.aap.org/disasters/terrorism-biological.cfm

www.aap.org/disasters/index.cfm

Natural Pandemics

Influenza

Episodic global pandemics are a near certainty in the future. While there are a variety of organisms that have the potential to cause pandemics, influenza pandemics are the most common and provide experience on which to base recommendations.

Historically, pregnant women have higher rates of morbidity and mortality with influenza infections. Years associated with antigenic shift are also associated with higher morbidity and mortality. The 2009 H1N1 Influenza outbreak is instructive. While the CDC published guidelines for Obstetrics patients and newborns were widely viewed as helpful during the outbreak, implementation was inconsistent. In future epidemics, NICU leaders should refer to published guidelines provided by the CDC and CAHAN. Basic principles follow:

Prevention:

- Mandatory influenza vaccination policies for all hospital staff. This should be made a condition of employment unless a **VALID** medical contraindication to vaccination exists.
- Trivalent inactivated influenza vaccine (TIV) is not contraindicated during pregnancy. All women, including adolescents, who are or may be pregnant during flu season, should receive TIV during autumn. Live-attenuated influenza vaccine (LAIV) is contraindicated in pregnancy.
- Pregnant staff members should not be assigned to care for patients infected with influenza.

Isolation:

- Standard and droplet precautions
- Pregnant women:
 - Initiate appropriate antiviral treatment as soon as possible.
 - Isolate the ill mother from healthy pregnant women. Place a surgical mask on the ill mother during labor and delivery, if tolerable (in order to decrease exposure of the newborn, healthcare personnel and other labor and delivery patients to potentially infectious respiratory secretions).
 - Place the ill mother in isolation after delivery.

- The mother who has influenza-like illness at delivery should consider avoiding close contact with her infant until the following conditions have been met:
 - She has received antiviral medications for 48 hours.
 - Her fever has fully resolved.
 - She can control coughs and secretions.
- As soon as all conditions are met, the mother should be encouraged to wear a facemask, change to a clean gown or clothing, adhere to strict hand hygiene and cough etiquette when in contact with her infant and begin breastfeeding (or if not able to breastfeed, bottle feeding). She should continue these protective measures, both in the hospital setting and at home, for at least 7 days after the onset of influenza symptoms.
- Meeting these conditions may reduce, but not eliminate, the risk of transmitting influenza to the baby. Before these conditions are met, the newborn should be cared for in a separate room by another person who is well.
- Breast milk is not thought to be a potential source of influenza virus infection. Oseltamivir treatment is not a contraindication to continued breastfeeding. **In 2009, the CDC recommended the use of expressed breast milk in lieu of direct breastfeeding while the mother was acutely ill.** If symptoms last more than 7 days, she should discuss the symptoms with her doctor. Protective measures might need to be continued until she is symptom-free for 24 hours. People who are once again well, 7 days after getting sick, are thought to be at low risk for transmitting the virus to others.
- Newborns delivered to mothers with active influenza infection:
 - The risk of transmission of novel influenza strains from mother to fetus is unknown.
 - The newborn should be considered to be potentially infected if delivery occurs during the timeframe of 2 days before through 7 days after illness onset in mother.
 - The newborn should be closely monitored for signs and symptoms of influenza. If signs or symptoms develop, testing should be performed, infection control measures should be continued and treatment with anti-influenza medications should be considered.

- Oseltamivir is approved for prevention of influenza in patients 1 year of age and older. During the 2009 H1N1 pandemic, an emergency use authorization (EUA) was issued for oseltamivir for influenza treatment and prevention in patients less than 1 year of age.

Measles:

Per the California Health Alert Network, as of 18 January, 2015 there have been 41 confirmed cases of measles in California, with 5 additional cases in other states and one case in Mexico. More cases will likely follow. Treatment Response Guidelines: Measles (**Appendix C, pg. 84**) gives general guidelines to NICU leadership for prevention, diagnosis and treatment in the NICU environment. The reader is urged to review CDC and CDPH guidelines, as well as follow California Health Alert Network updates for current status of the outbreak. (<https://cahan.ca.gov/default.aspx>)

Terrorism and Mass Trauma Events

Mass trauma events are not likely to impact directly on NICU patients. However, due to the large influx of patients to the adult and pediatric wards, surge capacity plans will need to be implemented. Staff may be pulled from mother-infant wards and NICUs to assist in the care of trauma patients. Early discharge protocols may be initiated to clear bed space. Blast damage to the institution or ongoing threat of attack may necessitate evacuation. See **Part IV-A, Natural Disasters, (pg. 15)** for discussion on surge capacity and **Part V, TRAIN[®], Triage by Resource Allocation for IN-patients, (pgs. 45-46)** for Evacuation and TRAIN[®].

Bomb Scare

Bombings are one of the most common methods of attack used by terrorists. Bombings can cause enormous damage and casualties with minimal risk to the terrorist organizations. Every bomb threat and incident will be unique; therefore response actions will be planned at the scene. Guidance should be provided to staff so that response to incidents can be as uniform as possible and responsibilities understood.

- **Receiving or discovering a threat:**

- Any person discovering a suspicious object should immediately notify hospital security stating name, telephone number from which he/she is calling, the time the object was discovered and the location of the object. The person reporting the incident should remain in place until security personnel arrive on scene. There must be no attempt to tamper with, touch or move suspicious objects. The immediate area where the suspicious object is located must be evacuated calmly and without confusion, closing any door(s) between the suspicious object and

personnel.

- Bomb threats received by telephone require the following action:
 - Remain calm.
 - Write as much information as possible (using a hospital bomb threat form, if available) while talking to the caller.
 - Record the time of the call and time to detonation if such information is given.
 - Record the suspected location if such information is given.
 - Written warnings discovered by any means should be reported immediately to hospital security.
- **Evacuation:**
 - Bomb scare threats pose a unique challenge to the NICU. Failure to respond to the threat when a bomb actually exists would be obviously catastrophic. Many times, such threats are unsubstantiated and no bomb actually exists. Evacuation of critically ill patients poses its own risks for patient morbidity.
 - Hospital Security and/or the Hospital Command Center will direct evacuation if required.
 - Evacuation to another site in the hospital is preferred if safe to do so, but evacuation outside of the building is often required.
 - Tiered evacuation based on categories may be helpful when the nature of the threat is not clear and moving patients is hazardous. An example of tiered categories follows:
 - Category 1:** Visitors, vendors, outpatients
 - Category 2:** Ambulatory inpatients, stable newborns and mothers
 - Category 3:** Non-ambulatory inpatients, stable PACU, patients in early stage of labor
 - Category 4:** Critical care patients, OB patients in 3rd stage of labor, intra-operative cases.

- **ENSURE THAT NO HAND HELD, TWO-WAY RADIO IS TAKEN INTO OR ENERGIZED WITHIN THE THREATENED AREA. ALL COMMUNICATIONS MUST BE DONE VIA MESSANGER AND/OR TELEPHONE.**
- Ensure all spaces inspected are marked with tape or chalk on the closed door, stating time and person responsible for checking area.

Labor Disputes

Labor disputes have the potential of creating acute staffing shortages. In such an event, surge capacity and NICU evacuation principles apply.

Region-wide Bed Shortages

Region-wide bed shortages can occur through a variety of mechanisms including, but not limited to, natural disasters, labor disputes and natural fluctuations in patient case load. Locum tenens hiring and small-scale transports to adjoining regions can often manage small gradual surges. When bed shortages are acute or of large magnitude, the most likely scenario being a natural disaster, the National Disaster Medical System (NDMS) can be activated. NDMS is a national program that provides for large-scale patient movement from disaster areas to non-impacted adjacent regions. Of importance to NICU leadership is that NDMS patient categories only include: Critical Care, Burns, Med/Surg, Pediatrics and Psychiatric. NICU and Obstetrics patients are not separately identified. It is incumbent on the NICU leadership to ensure that patient movement coordinators understand the critical asset needs of NICU patients and that they are moved to hospitals with appropriate resources. (See **Part V, TRAIN[®], Triage by Resource Allocation for IN-patients, [pgs. 45-46]**)

Violent Visitor

The NICU is a stressful environment for families and this stress may manifest in acting out behavior. Family members of NICU patients may act out towards staff or each other. The potential exists for domestic strife of staff members to play out in the unit as well. The priority is to maintain the safety of the NICU patients and the NICU staff at all times.

- **Prevention:**
 - Automatic social work consultation for all NICU patient families upon admission to NICU. Social workers will establish rapport with the families and identify potential conflicts early. Frequent family meetings can facilitate communication and serve to diffuse simmering issues with patient care.

- Locked access to the unit and clearly stated visitation protocols
- **Response:**
 - Call security early.
 - Escort angry visitor out of NICU to waiting area.
 - Do not escort to closed room or leave one-on-one with staff member.

Active Shooter

The potential for an active shooter scenario persists in our society. Locked access to the NICU with video surveillance of the entry points can provide safety for staff. In the event of an active shooter on campus, the NICU should lock down and staff shelter in place. If the location of the shooter is known and it is safe to do so, bring all visitors in waiting into the NICU before lockdown. If the shooter location is known and it is safe to do so, send a full resuscitation team to labor and delivery with a transporter and the necessary equipment to keep a newborn stable while on lockdown in the obstetric spaces. Once in full lockdown, no one is allowed in or out until a hospital “all clear” announcement is made. It is not possible to predict the duration of such an event and in prolonged standoffs between security and the shooter(s); the NICU may need to implement stand-alone capability procedures. The following basic principles apply when responding to an active shooter situation:

- **Run:**
 - If there is an accessible escape path, attempt to evacuate.
 - Bring patients with you.
 - Due to the difficulty of moving NICU patients, this option is likely not applicable to your NICU.
- **Hide:**
 - Get behind locked doors.
 - If possible, disable coded entry.
 - Turn off lights.
 - Pull curtains and shades down on windows.

- Stay clear of glass entryways and windows.
- Remain quiet.
- **Fight:**
 - If shooter in location and escape and hide are not possible, then hit, strike, kick, punch with anything available.
 - Everyone on site should swarm shooter.
- **Security Officer Response:**
 - Keep hands in plain sight so officers will observe you are not armed.
 - Obey all instructions including lying on the ground.
 - Answer questions if asked.
 - Try to remain calm.

Infant Abduction

The probability of an infant abduction in any one institution remains low, however the emotional impact on the family and the caregivers assigned to the abducted infant would be severe. The impact on the institution's reputation in the community and the legal ramifications to that institution would likewise be significant. There are many measures that an institution can implement to prevent such an event. In addition, a well-rehearsed response plan may thwart the abduction should one be attempted.

- **Prevention:**
 - Electronic infant banding: The ideal system is one where the band will alarm if the band is removed from the infant or a banded infant is removed from the unit.
 - Banded parents: Both parents are banded with at least two identifiers that match them with the infant. If there is only one parent, then a second support person, identified and approved by the parent, may be banded as well.
 - Restricted Visitation: Non-banded visitors must be escorted by staff or by a banded parent/support person to the room.

- Staff ID: All staff should be required to wear Hospital Picture IDs at all times. All nursery staff should be empowered to challenge any staff not wearing the ID at any time regardless of staff seniority.
- Restricted access to nursery: Locked entry with coded access can be employed. Alternatively, a 24-hour, staffed reception desk at the entry to the nursery can be used.
- Color coded scrubs: If budget allows, providing color specific scrubs for staff assigned to Labor and Delivery, the Newborn Nursery and the NICU can be employed. For this to be effective, staff would not be allowed to wear their own scrubs. Any visitor wearing different scrubs is then immediately identified as non-Nursery staff and can be greeted and asked about the reason for their visit.
- **Response Plan:**
 - Ensure all staff is familiar with their institution's internal signal for an infant abduction (e.g., overhead announcement of "Code Pink").
 - Have pre-assigned locations where staff position themselves when a possible abduction exists. Such locations should include all hospital exits.
 - Should a suspected individual be observed, do not get into a physical confrontation (infant may be harmed). Attempt to engage them in conversation, slowing them down. If possible and safe, follow the suspect watching their direction of flight.
 - If unable to stop individual, get a good physical description, direction of flight and other pertinent information (e.g., vehicle make and registration or accomplices) about the suspect.
 - If possible, lock down all hospital parking exits.
 - If possible, secure all egress points from hospital campus.
 - If the abductor successfully exits the hospital campus with the infant, immediately notify local law enforcement so that an Amber Alert can be issued.

Part IV: Specific Hazards

C. Infrastructure Failure

Introduction: Two broad areas of concern regarding infrastructure failure include:

- **Episodic Failure:**
 - Temporary loss of power, technology associated with maintenance of the babies may fail, or some other temporary issue may occur.
 - Many types of episodic infrastructure failure are amenable to pre-planning mitigation strategies. Such strategies can help bridge the gap created by such failure with minimal impact on patient care until services are restored.
- **Catastrophic Failure:**
 - Significant damage to hospital infrastructure or anticipated prolonged outage of critical systems may trigger a decision to perform a hospital evacuation. Such evacuation would be conducted under the authority and direction of the Hospital Incident Commander.
 - Preplanning requires recognition of potential threats or hazards and then development of management strategies to locate the resources and support patient needs.
 - An operational chart to track sustainability of services without external support for a minimum of 96 hours can help hospital and NICU leadership determine if an evacuation is required. In the event that supplies or equipment cannot be replenished, staff may need to improvise. It is important that staff become familiar with non-traditional methodologies to assist equipment-dependent emergencies for neonatal patients
- The first task in dealing with infrastructure emergencies is to complete a Pre-Disaster Assessment of Critical Infrastructure (**see Appendix D, Pre-Disaster Critical Infrastructure Self-Assessment, [pg. 104]**). A key consideration in deciding whether to issue a pre-event evacuation order is to assess vulnerabilities and determine anticipated impact of the emergency on the hospital and its surrounding community.

Critical Infrastructure Self-Assessment Worksheet

- A Pre-Disaster Assessment of Critical Infrastructure Worksheet is divided into eight sections: municipal water, steam, electricity, natural gas, boilers chillers, powered life support equipment, information technology, telecommunications and security. The Worksheet can be used in conjunction with the National Infrastructure Protection Plan (NIPP), which is a management guide for protecting critical infrastructure and key resources. (https://www.dhs.gov/sites/default/files/publications/NIPP_Plan.pdf) Decision teams should know how long their hospitals could shelter-in-place if critical infrastructure is damaged.

Example: How long could the hospital maintain a safe temperature without city water during the summer months and how long could essential power be maintained with only the current on-site fuel supply?

- The Pre-Disaster Assessment of Critical Infrastructure Worksheet is designed to help decision teams consider the vulnerabilities of their critical infrastructure and their hospital's ability to shelter-in-place, which in turn may guide investment decisions for mitigating vulnerabilities.
- If critical infrastructure has not sustained damage, the hospital's ability to shelter-in-place will be affected by the extent to which staffing levels can be maintained, and whether the supply of critical consumable resources – such as food, blood and medications – can meet the needs of patients and staff, drawing on existing caches within the hospital and regular and backup supply channels. Maintaining safe levels of staffing and consumable resources should be addressed in a hospital's plan for sheltering-in-place. If there is no such plan, the ability to shelter-in-place for more than a few days may be degraded.

Loss of Water Supply:

- Considerable anecdotal evidence, as well as published reports, indicates that loss of water will lead to hospital evacuation if not promptly restored. Loss of the municipal water supply also jeopardizes hospital sprinkler systems and, in some hospitals, heating systems. A hospital pre-disaster self-assessment should recognize the presence/absence of backup water supply lines (in the event that the main line fails) and any on-site water reserves, such as a storage tank or wells.
- In order to maintain daily operations and patient care services, health care facilities need to develop an emergency water supply plan to deal with total or partial interruption of the facilities' normal water supply. Water supply interruption can be caused by several types of events such as natural disaster, a

failure of the community water system, construction damage or even an act of terrorism.

- *Examples* of critical water usage in a health care facility that could be impacted by a water outage; Water may not be available for:
 - Hand washing and hygiene
 - Drinking at faucets and fountains
 - Food preparation
 - Flushing toilets and bathing patients
 - Laundry and other services provided by central services (e.g. cleaning and sterilization of surgical instruments)
 - Reprocessing of medical equipment, including that typically performed by special services (e.g., bronchoscopy, gastroenterology)
 - Patient care (e.g., Hemodialysis, hemofiltration, ECMO, hydrotherapy)
 - Radiology
 - Fire suppression sprinkler systems
 - Water cooled medical gas and suction compressors (a safety issue for patients on ventilation)
 - Heating, ventilation and air conditioning
 - Decontamination/hazmat response
- Regardless of size, a health care facility must have a defined emergency water supply plan in place to ensure patient safety, quality of care while responding to and recovering from a water emergency.

- Take action in the NICU

Expected Problem	Possible Solution
Ice machine not working	Call nutritional services for emergency ice needed for medical treatments
Water lines broken	Move patients/staff to safe area. Notify HCC via hospital-specified disaster assessment form; use courier if necessary
Toilets not functioning	Toilets are bagged with plastic bags to collect raw sewage (red biohazard bags are not required unless there is visible blood; also increased disposal costs if red bags are used)
No water	Use moist towelettes, alcohol wipes or antibacterial gels or foams to clean hands. Notify HCC via hospital-specified disaster assessment form

- The following water resources could be utilized if the water supply is disrupted:
 - For human consumption:
 - Bottled water from in-hospital supplies and vendors (primary sources)
 - Pharmacy IV and irrigation bottles
 - Ice machines
 - Distilled water from central service department within the hospital
 - Highest consideration for use of water shall be as follows:
 - Provide drinking water for patients and staff
 - Cleanse skin of patients after removal of as much soiling as possible
 - Perform oral hygiene
 - Cleaning and low level disinfection of non-critical patient care items or equipment within the patients' environment,

reprocessing and high-level disinfection of critical and semi-critical patient care items and surgical procedure instruments

- Food preparation
- Hand hygiene

Steam

Some municipalities use large steam production plants to create steam and pipe it underground to buildings in local areas, including hospitals. Steam production plants are critical infrastructure, as are the pipes that deliver steam to area hospitals. Loss of water to steam production plants, inability to generate steam or inability to pipe it underground to hospitals would jeopardize heat and could lead to hospital evacuation within 1-2 days during the winter months. Some hospitals also use the incoming steam to generate electricity and for such hospitals, loss of steam would also mean loss of some of their electrical capacity. A hospital self-assessment should therefore include recognition of reliance on steam that is generated off-site and piped in for heating purposes, electricity generation or both.

Natural Gas

For hospitals that use natural gas for heat and/or hot water, damage to gas mains lasting more than 1-2 days (especially in winter) could lead to an evacuation. A hospital self-assessment should therefore recognize reliance on natural gas, whether there is more than one gas line feeding the hospital, and whether gas from just one intact gas line could meet the most critical needs of the hospital.

Boilers/Chillers

Some hospitals use boilers to generate hot water; others use them for heating purposes as well. Most hospitals also have chillers for air conditioning (with or without cooling towers). Redundancy in these types of critical infrastructure is rare, and their loss could necessitate an evacuation, depending on weather conditions. A hospital pre-disaster self-assessment should therefore recognize vulnerabilities due to the loss of boilers or chillers, irrespective of the loss of electricity, water or steam.

Electricity:

- Prolonged loss of electricity can lead to HVAC loss, which can necessitate evacuation. In addition to controlling ambient temperature, electricity is essential for many medical technologies (e.g., monitors, CT scanners, dialysis machines, ventilators, incubators, ECMO pumps) as well as other critical

functions. Patients dependent on electricity-driven life support equipment would require evacuation soon after power failure. Ventilator battery packs, for example, last only 2-3 hours, and the accompanying suction devices generally have no battery packs. NICU leadership should know which neonatal ventilators have battery backup. The number of hours that a hospital can function without municipal electricity, or adequate fuel for backup generators, may be critical factors in an evacuation decision.

- Most hospitals have backup generators, although the adequacy of these generators should be carefully assessed. For example, backup generators require fuel, and hospitals vary considerably in their on-site fuel storage capacity, whether there is a direct feed from the fuel tank to the generators and whether it would be possible to refill the fuel storage tank – which is often underground – after an earthquake. Hospitals may need additional portable generators, which can be brought to individual units to supply limited emergency power. It is essential that only equipment necessary to sustain life and limb be plugged into emergency power outlets so as not to overtax the backup power generators.
- A hospital pre-disaster self-assessment should include the number and size of backup generators and an estimate of the length of time these generators can sustain electrically powered life-support equipment and HVAC. A self-assessment should also consider the fuel storage capacity on site and any potential refueling issues. The emergency power is tied to essential life support systems, emergency lighting, elevators and fire and life control systems.
- Take Action in the NICU: If the power goes out in your NICU, what should you do?
 - Wait 8-10 seconds; the emergency generator will turn on the power. Notify HCC. Check that all essential equipment is plugged into red outlets and all life support equipment is properly functioning.
 - Disconnect or turn off non-essential equipment that may be plugged into emergency power (red outlets). Examples of non-essential equipment include: fans, personal portable equipment, redundant computers and printers. NICU leaders may need to police emergency power outlet.
 - Switch CPQC patients to gas only.
 - Consider using pulse oximeters in lieu of bedside monitors.
 - Consider using headlamps, which should be stocked in the NICU.

- Have emergency flashlights available for hallways and stairs.
- Stabilize sedated patients. Turn off non-essential electrical equipment.
- Staff should remain calm. Locate flashlights, if necessary, and await instructions from your immediate supervisor.
- What should you do if you get stuck in the elevator?
 - Stay calm.
 - Use the elevator phone or emergency alarm to call for assistance
 - Do NOT try to climb out of the elevator

Powered Life Support Equipment

Some powered life support equipment (e.g., ventilators, IV infusion pumps) has backup battery packs in the event of an electrical failure. The life of these batteries is generally 2-3 hours; patients dependent on such equipment may therefore need to be evacuated more quickly than others. A self-assessment should include an inventory of the powered life-support equipment in use on an average day, how many of these have backup battery packs and how many hours these batteries will last (the latter being a critical factor in deciding how quickly such patients must be evacuated). Check to see whether your neonatal ventilators have built in batteries and if so, how long the batteries' power will last. Patients that are stable may need to be converted to T-piece ventilators (e.g., Neopuff). Centers that are providing ECMO need to identify other ECMO centers to arrange for transfer.

Health Information Technology

- Loss of health information technology (IT) and telecommunications systems may significantly reduce a hospital's ability to deliver health care services efficiently. For example, if a hospital's computerized provider order entry (CPOE) system suddenly goes offline, substantial delays in order completion can be expected, as well as increased risk of errors. In other instances, service delivery may cease altogether because automated systems cannot be quickly replaced by manual systems. For example, hospitals that rely on decentralized pharmacy and automated dispensing units may no longer have redundant systems for safely filling patient medication orders.
- If patients must be evacuated, paper records are relatively easy to send with them, but many hospitals are moving away from paper records in favor of electronic medical records (EMR). Some EMR systems can rapidly create and

print a paper discharge summary to accompany each evacuated patients; other systems cannot, and the time required to create useful discharge summary (current medications, allergies, orders, brief history) may substantially delay evacuation.

- Take Action in the NICU:
 - NICUs need to confirm the capabilities of their EMR provider and whether relevant medical records can be generated in a timely fashion.
 - NICUs may opt for pre-printed copies of admission H&P, physician order sheets and progress notes, as well as a condensed plan covering list of medications with dose, vent settings, oxygen setting, etc.

Example: electronic kardex from EPIC with diagnoses, MAR. This will serve to sign-out present patients' status, problems and medications in paper form, including a hard copy of charge nurse sign-out.

- Physician to physician transfer is needed prior to actual transfer of patient (may not be possible in large scale evacuation).
- Preservation of Vital Records:
 - Hospitals must identify the most critical information needs for patient care, treatment and services when creating the Emergency Operations Plan. Plans must be in place to identify alternative means for processing data, providing for recovery of data and return to normal operations. The types of vital records that will accompany patients in the event of a disaster, how charting will occur when computer systems are down and how records will be stored must be considered.
 - The Hospital Incident Command System Documentation Forms are used to collect patient information and track patients, victims and fatalities. HCIS forms are also used to account for communications, decisions, operation activities, personnel time and resources utilized. In addition, after a disaster, these forms may be valuable tools when seeking reimbursement from government agencies and insurance companies. HCIS forms and downtime charting forms necessary for the preservation of vital records are included in the appendix. (Disaster Documentation and Forms Go-Kit).

Telecommunications:

- It is recommended that facilities test for communication redundancies due to the inherently fragile condition of the NICU population and their needs.
- Redundant communication strategies must be established to direct staff and communicate information to patients, families and external agencies. It is important to address all communication systems available to staff, as well as the person or department that is responsible for maintaining such systems or devices. Landline phones, cell phones, 2-way radios, two-way pagers, fax machines, mass notification systems, television/radio stations and internet websites all the way down to couriers or runners are all methods that may be listed as communication systems in hospitals. These devices may be used alone or in combination, should one or more systems fail. The Hospital-wide Emergency Operations Plan should have a disaster communication plan. NICU leaders should familiarize themselves with this plan and understand the options available in the event of a communications breakdown.
- Internal communication should include a range of methods to communicate to staff and patients, as well as the hospital command center. Staff should use their normal communication tools (land lines, cell phones) if those systems are operational. Alternative means of communication should be utilized when standard communication tools are compromised. Current standards in communication rely profoundly on landlines and radio communication during disasters. Potential problems with these methods are that landlines are not portable and can incapacitate a leader in a unit. Make sure that two-way radios can connect with the Hospital Command Center. Radio airways can become very congested due to numerous participants on the same channels, which can cause detrimental errors in communication. Radio communication should follow strict hospital protocol and be limited to official communication only. Radio waves also have difficulty with some hospital infrastructures and can become ultimately non-functional. The loss of cellular phones may also occur leaving a hospital with ultimately no form of communication. Satellite media have been proven to be one of the most reliable forms of communication during disaster situations. Using wireless technology along with high-speed broadband connectivity can improve disaster communication and help keep everyone informed. (www.calhospitalprepare.org). If the emergency operation plan is activated, caregivers must follow the chain of command.
- Local wireless cell phone networks may fail as well because the data systems that exchange information for routing and billing may lose power. Because information for each account holder and cell phone device is generally stored on computers in the “home” market where the account is held, every customer with accounts originating in the local area may lose wireless service.

- Institutions and individuals with computers equipped for Voice Over Internet Protocol (VOIP), and who have power and Internet access may retain telephone communication. In VOIP, the audio (voice) signal is converted to digital packets of information that travel from one Internet address to another on the same VOIP system. VOIP networks were deployed by FEMA and by fire and other emergency responders in the days and weeks following Hurricane Katrina.
- Lack of radio interoperability between hospitals and emergency responders, as well as between different teams of emergency responders (fire, military, police, EMS) may also jeopardize essential communication. The Federal Government does not mandate how a State or local community organizes incident response activities or communications. The self-assessment focuses on the extent to which computer servers and essential data are backed up or managed offsite, whether redundant hardware and software systems exist, whether manual, paper-based systems can be quickly reintroduced, and whether the hospital has backup telephonic communication that does not rely on local service providers.

Medical Gas Failure: (oxygen, nitrous oxide, nitrogen, vacuum and compressed air)

Should a failure of the medical gas system occur – **Take Immediate Action.**

- Take Action in the NICU:
 - At the first sign of failure, utilize portable gas cylinders to stabilize patients. Every department that uses medical gas should maintain actively charged portable bottles.
 - How to charge your system using H cylinders - If system wide gas failure, isolate the zone(s) within the NICU from the rest of the hospital. Plug Oxygen and Medical Air H cylinders into respective outlets within the isolated zone. Must have approval from the hospital and fire department before isolating zones and charging with H-cylinders. These bottles must be easily accessible. It is the individual department's responsibility to make sure that actively charged portable bottles are present.
 - Have someone in the affected area report the system failure to engineering. Do not leave patients unattended while reporting the failure.
 - For compressed air and/or vacuum failures, call Facilities Services. Physical backup is maintained two and three levels deep and these services should be restored momentarily.

Problem	Possible Solution
Vacuum not working	• Notify HCC via disaster assessment form. • Contact Central Service for portable suction machines • Use handheld suction that should be included in room disaster bags. • Discontinue unnecessary suction.
Air/oxygen not working	• Discontinue unnecessary oxygen. • Contact Respiratory Care for emergency oxygen. • Use medical gas back-up system.
Ventilators not working	• Use self-inflating bag-valve mask. • Use Neopuff (preferred). • Have adequate personnel to ventilate manually. • Use compressed air and oxygen cylinders, regulators (use transport grab-and-go cylinders).
Heat/Air Conditioning Loss	• Have additional blankets/hats. • Use chemical warming mattresses. • Provide kangaroo care by family members. • Use battery-operated fans.

Part IV: Specific Hazards

D. HAZMAT Accidents

Hazardous material is defined as any substance, gas, liquid or solid that has the potential to cause injury. Hazardous materials can be further categorized as chemical, biological, or radiological. DECON procedures require trained personnel and specialized equipment. Incorrect procedure will result in incomplete decontamination, cross contamination of healthcare providers and potential shut down of part or all of the healthcare facility. Hot zone/cold zone protocols must be strictly enforced. Radiation decontamination is highly specialized and should be carried out by or under the direction of trained Radiation Safety personnel.

Exposures in a healthcare setting can occur in several ways:

- Small scale incidental spills from therapeutic or diagnostic agents
- Hazardous exposures in laboratories, machinery spaces and physical plants
- Toxic fumes from accidental fires
- Nearby industrial accidents or transportation accidents
- Intentional CBRNE attacks

NICU responses:

- Small scale spills/exposures:
 - Isolate area.
 - Evacuate staff and patients to safe location within hospital.
 - Notify Safety, Industrial Hygiene, or radiation safety as appropriate.
- Environmental exposures:
 - Shelter in place.
 - If NICU compromised by toxic agent, evacuate staff and patients to decontamination site.

DECON Procedures

- Assumptions:
 - EMS decontamination may be negligible.
 - Significant number of patients will self-refer to healthcare facility before first responders arrive on scene and will be contaminated.
 - There will be a large percentage of unaffected persons self-referring (i.e., the “worried well”).
 - Casualties arriving by EMS will require secondary decontamination.
- Biologic agents will have a delayed presentation and may or may not require decontamination.
- Chemical agents will result in rapid onset of symptoms and require urgent decontamination.
- Radiation exposure will result in delayed onset of symptoms and priority is first to save life and limb.
- Pediatric Concerns:
 - Children are particularly vulnerable to HAZMAT exposure.
 - Many agents remain low to ground and children receive disproportionate exposure.
 - Large surface area to volume ratio puts children at greater risk from cutaneous agents.
 - Small children need significant help with decontamination.
 - Decontamination requires removal of all clothing and washing down placing infants and small children at risk for hypothermia.
 - Pre-verbal children may get separated from parents or guardians during the decontamination process. With decontamination they will lose clothing or other identifiers. Strict chain of custody by DECON staff (or assigned hospital staff in cold zone) must be maintained until re-united with guardian. Pediatric, nursery and NICU staff may be called to assist

with care of decontaminated pediatric casualties and should be cognizant of their institutions DECON protocols.

Part V: TRAIN® (Triage by Resource Allocation for IN-patients)

The California Association of neonatologists and the District IX AAP Section on Perinatal Pediatrics have endorsed TRAIN®. In order for TRAIN® to be effective, it is necessary for all NICU leaders to begin using TRAIN® nomenclature to categorize the infants under their care. This should be done on a daily basis so that the information is available immediately should evacuation be required. It is imperative that regional Offices of Emergency Services (OES) have buy-in to this system of triage. TRAIN® cannot be used without regional agreement and cooperation with your OES.

Introduction

When large-scale, movement of patients occurs, as in a hospital evacuation or regional catastrophe, normal patient referral networks and transport team protocols will be suspended. Control of ambulance assets will be under the control of regional OES or Medical Operations Centers (MOC). Requests for patient movement will also be regulated by the OES or MOC.

- This centralized control is critical to the smooth flow of patients throughout the region. Individual NICU leaders will have limited visibility on the status of other NICUs in the region. If multiple hospitals are evacuating and each NICU leader attempts to secure bed space in non-affected hospitals, control of patient movement will rapidly deteriorate.
- Regional OESs and/or MOCs have the ability to track the status of all area hospitals and are best positioned to distribute available ambulance assets and assign beds to evacuated infants.

TRAIN® is an ambulance asset triage tool, designed to maximize efficient use of BLS, ALS, CCT and Specialized Ambulance services during a large disaster.

- In adult ICUs and PICUs, the critical condition of the patient is implicit. When they are no longer critical, they are moved to adult medical/surgical wards or pediatric wards. When ICUs and PICUs are evacuated, it is appropriately assumed that they will need critical care ambulances.
- NICU patients often do not move after they recover from the critical phase of their illness and may convalesce for months in the NICU. NICU patients cover a broad spectrum of acuity. At one end is the ELBW infant on ventilator support, pressor support, TPN and rigid environmental control and the term surgical, HIE or PPHN patient requiring advanced life support. On the other end of the spectrum is the convalescing ex-preemie in an open crib and room air, learning how to nipple feed.

- It makes no sense to dispatch critical care ambulances for all NICU patients and this is not efficient utilization of resources. Nor is it safe to dispatch BLS ambulance assets for critical babies.
- TRAIN[®] allows regional OESs and MOCs to dispatch the appropriate mix of ambulances to a given hospital for safe NICU evacuation.

TRAIN[®] Categories

- It is recommended that the patient's primary care nurse assign the appropriate TRAIN[®] category daily. This assignment can be tracked in the EMR, on a central patient status board or on shift change sign out sheets. Each NICU is free to determine which method is most efficient for their unit.
- Should evacuation appear imminent, The TRAIN[®] patient list can be quickly vetted by the Senior On-Service Neonatologist and Shift Charge Nurse. This information is then passed up the HICS chain of command to the HCC and from there, reported to the regional OES/MOC.

TRAIN[®] Assignment Grid (Table 5A)

<i>Transport</i>	<i>Car</i>	<i>BLS</i>	<i>ALS</i>	<i>CCT</i>	<i>Specialized</i>
Life Support	Stable	Stable	Minimal	Moderate	Maximal
Mobility	Car/Carseat	Wheelchair or Stretcher	Wheelchair or Stretcher	Stretcher	Incubator or Immobile
Nutrition	All PO	Intermittent Enteral	Continuous Enteral or Partial Parenteral	TPN Dependent	TPN Dependent
Pharmacy	PO Meds	IV Lock	IV Fluids	IV Drip x1	IV Drip ≥2

Life Support	Minimal =	Hood or Low Flow Cannula O2, chest tube, etc.
	Moderate =	CPAP/BiPAP/Hi-Flow, Conventional Ventilator, Peritoneal Dialysis, Externally paced, continuous nebulizer treatments, etc.
	Maximal =	Highly specialized equipt., e.g., Neonatal Ventilator, HFOV, ECMO, iNO, CVVH, Berlin Heart, wt ≤ 1.5 kg, etc.
Pharmacy	IV Drip =	Pharmacologic agents, not TPN, that cannot be discontinued for transport.
Mobility	Car/Carseat =	Able to ride in automobile with age-appropriate restraints.
	Stretcher =	Includes pediatric transport gurney with size-appropriate securement harness.
	Incubator =	Transport incubator with equipment for connecting to ambulance
	Immobile =	Unsafe to move without special equipment e.g., neurosurgical/bariatric

Hospital Levels

TRAIN[®] will quickly assign **ambulance asset needs** but does not specify **NICU level**. While it may seem intuitive that higher-level ambulance needs correspond to higher level NICU needs, this is not always true. In a pilot exercise in San Diego County in 2011, it was found that some of the patients were assigned to lower level NICUs than their condition required. Examples follow:

- A stable pre-op congenital heart patient awaiting a bed at the regional level IV NICU was on room air and a PGE drip. An orange or yellow category TRAIN[®] assignment could reasonably be made. In the exercise, the patient was assigned to a LEVEL II facility by the MOC, where clearly this patient required access to the regional Level IV NICU.
- Several stable and convalescing surgical patients had yellow TRAIN assignments. These babies were also assigned to regional Level II facilities.
- In the above cases, the errors were discovered before simulated patient movement and corrections were made, but at the cost of additional delay.
- In some cases, patient movement will necessarily need to be very fast (e.g., encroaching wildfire, severe building damage from earthquake). It may not always be possible to move all babies to appropriate level NICUs. In these instances, babies will be moved temporarily to lower levels of care. Even in these instances, it is useful to assign NICU levels. This will allow the OES/MOC to track infants sent to lower levels of care and move them to an appropriate level NICU as soon as bed space allows.
- It is recommended that NICU leaders modify TRAIN[®] color categories with the appropriate NICU level need using criteria established in the **2012 AAP Committee on Fetus and Newborn policy statement on “Levels of Neonatal Care”**.
 - Examples:
 - Baby Girl Alpha: Yellow-II
 - Baby Boy Bravo: Red-III
 - Baby Boy Charlie: Red-IV
 - Baby Girl Delta: Yellow-III

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APPENDICES

Appendix A: NICU DISASTER AND EVACUATION PROTOCOL, Good Samaritan Hospital, San Jose, CA.....	51
Appendix B: JOB ACTION SHEETS/CARDS - MASTER LIST	60
Appendix C: BIOTERRORISM TREATMENT RESPONSE GUIDELINES.....	68
Appendix D: PRE-DISASTER CRITICAL INFRASTRUCTURE SELF-ASSESSMENT*	104

APPENDIX A: NICU DISASTER AND EVACUATION PROTOCOL

Good Samaritan Hospital, San Jose, CA

I. NICU General Disaster Plan.

- a. Initiation. At the first indication of problems (fire, structural damage, electrical power, medical gases, etc.):
 - a. Dial 5555, report location (specific room of the NICU) and nature of emergency
 - b. Notify respiratory therapy and the neonatologist on duty.
 - c. Ancillary personnel who will respond to an overhead code will go to the NICU and report to the charge nurse.
- b. Communication. The manager on duty or charge nurse makes contact with the command center using available communication.
 - a. The **direct connect** function on the Nextel phones will work during a power failure and should be used for internal communication. Hospital phones may not be operational.
 - b. Communication with the Hospital Command Center:
 1. 2-Way Radio/Disaster Phone. Manager on duty or charge nurse should obtain the radio from its location at the NICU secretaries' desk. **The radio is preset** to the channel that will communicate with the hospital's Incident Command Center in Conference Room 4 once it has been established that the command center has been "opened."
 2. Landlines to Conference Room 4: 371-7766
 3. Bypass phone in NICU:
 - a. Ext: 4721
 - b. Switchboard number: 559-1924
- c. Maintaining ventilation:
 - a. Hand-ventilate infants using the patients bedside bag or self-inflating bag found in the emergency kits
 - b. Turn off bedside bags if not in use to conserve medical gases.
 - c. If loss of oxygen or compressed air persists for more than 5 minutes and evacuation is not necessary, Respiratory Therapy will back-feed H-cylinders of oxygen and or compressed air into the life-support panels.
 - d. iNO can be delivered via a modified anesthesia bag as outlined in the iNO policy.
- d. Suction:
 - a. Use portable suction for ETT suctioning of critically ill infants located in the med room of the NICU. Access code: **123**

- b. Maintain chest tube systems to water seal as long as the collection chambers remain below the infant's chest, even if the wall suction is not functioning.
- e. Maintaining Heat:
 - a. Term and late preterm infants ≥ 34 wks.: Use regular and warmed blankets as needed to maintain temperature
 - b. For infants in incubators and those < 34 weeks: Cover infant with thermal blanket and hat located in backpack. Wrap securely in regular blanket over the thermal blanket to keep it in place.
- f. Maintaining Infusions:
 - a. Check pump battery power. If not working, locate another pump with functional battery.
 - b. If unable to locate battery-powered pump, give slow IV pushes of appropriate IV fluids to maintain patency of the IV; do not exceed the hourly IV rate ordered.
 - c. Provide continuous feedings manually if necessary, with small intermittent boluses every 30-60 minutes.
- g. Monitoring vital signs
 - a. Use battery-powered pulse oximeters for infants who require continuous monitoring.
 - b. If portable monitoring equipment is not available, assess infant's color, respiratory status and heart rate.
- h. Lighting
 - a. Emergency back-up battery operated floodlights activate if power is lost
 - b. Use battery lanterns located at bedsides in each room
 - c. If necessary, use flashlights located in emergency kits.
- i. When power and gas are restored:
 - a. Ensure that all patients are safely re-secured to support devices and that all equipment is functional.
 - b. Each patient's nurse must document on the flow sheet and objective assessment of the patient's condition (similar to that done at the start of each shift), as well as a description of interventions to maintain life support during power/gas loss.
 - c. The charge nurse must complete an incident report totaling the time of power/gas loss and restoration, a description of actions taken by staff, and any specific effects.

II. NICU Evacuation Plan

- a. Total Evacuation. Decisions to perform a total evacuation of the NICU or areas of the NICU will be made by the Hospital Incident Commander or the Fire Chief.
- b. **Note:** Under emergency conditions when patients are in immediate danger, partial evacuation of at-risk patients must occur. The responsibility for making this decision is left to the manager/assistant manager, if in house, or charge nurse in consultation with the neonatologist on duty. If they are not available, the bedside nurse is responsible for removing the patient from immediate danger.
- c. The persons responsible for carrying out the NICU evacuation are the neonatologists and charge nurse.
 - a. The charge nurse will assign duties and ensure that processes are followed according to the Evacuation Procedure heading on page 4 and 5 of this document.
- d. Infants may be evacuated to another area within the hospital or to a designated area outside the hospital.
 - a. Horizontal evacuation.
 1. First choice: 2nd Floor MBU Nursery (code for doors is **9998**).
 - b. Vertical Evacuation. In the event of a need to make a vertical move to evacuate the 2nd floor, babies can be moved (by stairs only, unless the elevators are cleared by the Incident Commander, Fire Department or Safety and Security) to:
 1. Nursery in the Pediatric Ward on 1st Floor
 2. Outside the Hospital (destination will be determined by the Hospital Incident Commander).
 - c. Once evacuated, personnel are to remain at the designated evacuation site and are not to return to the evacuated area unless ordered to do so by the Fire Department, nursing supervisor, or safety coordinator.
- d. Emergency Bedside Backpacks. Emergency backpacks are located at each bedside one for each patient. They contain:
 1. Self-inflating anesthesia bags and masks
 2. Heimlich valve
 3. Bulb syringe
 4. Stethoscope
 5. Portawarmer
 6. Thermal blankets and hats

7. Formula & nipples
8. Feeding syringes
9. Diapers & wipes
10. Flashlight
11. Notepad and pen
12. Watch
13. Hand sanitizer
14. Sterile gloves
15. Sali wipes & alcohol wipes
16. Transpore tape
17. Whistle

- e. NICU Disaster Boxes. Several red disaster boxes will be available for each 1-2 rooms of the NICU. They contain commonly used supplies:
 1. Intubation supplies: ETT, stylettes, laryngoscopes & blades
 2. IV access supplies
 3. Portable suction machines
 4. Suction catheters and tubing
- f. Personnel to assist with the evacuation will be made available through the nursing and personnel pools.
 1. In a disaster, the nursing supervisor, or designee, is responsible for initiating the emergency call tree for the nursing department. The nursing supervisor will assign nursing and ancillary staff to the NICU to assist with the evacuation, as requested by charge nurse.
 2. Number of extra staff needed will be estimated by the following:
 - a. 1 person for every 2 low acuity patients (no respiratory support)
 - b. 1 person for every moderate acuity patient (cannula/cpap)
 - c. 2 persons for every high acuity patient (on mechanical ventilation)

III. **Disaster/Emergency Evacuation Procedure** (may be performed simultaneously, depending on the type of emergency). Evacuation will be performed upon order from the Hospital Incident Commander or Fire Department Chief. The following will be put into place regardless of the type of emergency/disaster:

Charge Nurse will:

- a. Obtain 2-way radio/disaster phone from secretaries' desk ("code triage" overhead page means that the Command Center is open and you should use the disaster phone/2-way radio).
- b. Obtain duty cards from inside pocket of Emergency manual, and forms from Emergency Management Recording Forms box ("code triage" overhead page means that the Command Center is open and you should use the disaster phone/2-way radio).
- c. Designate area leaders for room 1, 2/3, 4/5/6, & 7/8, and give them "bedside nurse" duty cards to pass out to EACH bedside in their areas.
- d. Distribute duty cards to other individuals listed on duty cards.
- e. Gather extra Nextel phones (possibly relief, tech, RT 2, GSH 2, and PICU) and distribute to area leaders.
- f. Consider using "emergency" button on Nextel phones to communicate with area leaders, relief nurse, neonatologist, and secretary all at once.
- g. Consult with the neonatologists to review the patients and to determine the order of potential evacuation (decision to evacuate will most likely be made by Command Center).
- h. Obtain file box from Emergency Management Reporting Forms (located in charge nurse room).
- i. HICS form #214 is used to document your actions (i.e. any communications with the Command Center, notifying Management Team, interventions during incident – moving patients, etc.).
- j. Form #254 and form #255: Give to secretary. Have her place labels on them or fill them out by hand with patient names. Have a runner take the forms down to the Command Center.
- k. Designate a relief nurse to set up evacuation site (send a buddy and Nextel phone along, if possible) and gather other supplies listed on their duty cards.
- l. Bring Emergency Manual, Emergency Management Recording Forms box, charge nurse rand, daily assignment sheet, and phone list if/when evacuating unit.

Neonatologist will:

- a. Collaborate with the charge nurse in triaging infants
- b. Collaborate with the Charge Nurse in assigning a practitioner or relief nurse to go to the evacuation site with the first infants and act as coordinator
- c. Initiate the neonatologists' emergency call list
- d. Assist with stabilization and transport of the sickest infants

Secretary will:

- a. Remain stationed at the desk as long as possible to send and receive communications
- b. Notify the medical and nursing directors of the evacuation (if they are not already present).
- c. Bring an updated census to the evacuation site.
- d. Act as scribe for forms as directed by charge nurse.

Relief nurse will:

- a. Distribute portable suction to rooms if sheltering in place. Bring portable suction along if evacuating.
- b. Gather portable monitors from counter outside NICU staff restroom and other standing portable monitors, if time allows.
- c. Gather bassinets (open cribs), if time allows.
- d. Assign ancillary helpers for purposes of gathering and carrying supplies as needed and set up evacuation site as instructed by charge nurse & neonatologist.
- e. Mobilize any additional transport equipment applicable to the situation (bring a buddy, if possible).
- f. Assist charge nurse with other duties as needed.
- g. Take role of all staff and patients at evacuation site as they arrive.

Area Leaders will advise others in the room to:

- a. Place ID bands on all infants.
- b. Place hats on all infants and wrap in a blanket.

- c. Place patient label on each infant's hat and secure w/ tape.
- d. Assemble evacuation aprons, disaster backpacks, patient charts, labels, and kardexes.
- e. Obtain downtime charting forms, if Meditech is down.
- f. Make sure all lines are heplocked, if evacuating unit.
- g. Obtain and fill out pink Patient Evacuation Tracking Form (HICS #260) for each patient.

Respiratory Therapy will:

- a. Organize E-cylinders and H-cylinders to be used at evacuation site.
- b. Distribute Neopuffs to bedsides, if sheltering in place.
- c. Bring Neopuffs along, if evacuating.
- d. Gather red disaster (intubation) supply boxes.
- e. Shut-off gas valves if indicated, by order of neonatologists, charge nurse or Fire Marshall.
- f. Assist with infants on nasal cannula, CPAP, or ventilators.

Bedside nurses will:

- a. Prepare infants by affixing ID band to limb.
- b. Infants should be wearing hats and wrapped in blankets.
- c. Place an identifying patient label on each infant's hat and secure with tape.
- d. Assemble disaster backpacks, patient charts, patient labels, and shift kardexes (if time allows).
- e. Disconnect as many tubes and wires as possible, if evacuating.
- f. Heplock all IV's, including central lines, if evacuating.
- g. Disconnect chest tube drainage systems from suction and place to water seal, if evacuating. Ensure that the drainage system is kept below the level of the infant's chest. Heimlich valves are located in the emergency kits.

- h. Fill out pink Patient Evacuation Tracking Form (HICS #260) for each patient.

Ancillary staff will:

- a. Report to the charge nurse to receive instructions.
- b. Assist charge nurse, area leaders, and relief nurse in gathering and carrying supplies, as needed.
- c. Give special attention to maintaining clear aisles and mobilization of equipment & supplies needed for the evacuation.
- d. Carry disaster backpacks, patient charts, and other supplies to evacuation site.

Evacuation:

- a. For horizontal evacuation, transport all infants to the nearest contiguous smoke zone on the same floor. Leave infants on warmers, in isolettes, or in open cribs, if possible. Bring along IV fluid and pumps, if possible. The first choice will be the MBU on 2nd floor.
- b. For vertical evacuation, transport infants to ground floor or basement in the following order, with the Nursery on 1st floor Pediatrics the first choice and the Children's Surgery Center the 2nd choice). Outside the hospital, one of the four Assembly Areas will be utilized. The specific destination will be determined by the Hospital Incident Commander.
 - **Infants who are the least sick** (without oxygen, chest tubes, etc.): Use the evacuation vests to transport up to 4 infants at a time (2 in each vest, if possible).
 - **Infants receiving oxygen per nasal cannula or hood** may have the oxygen disconnected if necessary to evacuate the infants quickly, or if time, use E-cylinder tanks where available.
 - **Infants requiring CPAP or mechanical ventilation** will be hand ventilated using the self-inflating anesthesia bags or CPAP bags with E-cylinder oxygen, if possible.
 - Do not use elevators for evacuation unless specifically ordered to do so by the Hospital Incident Commander or a Fire Department official.
 - The following techniques may be used to evacuate the most critical infants:

1. Using three persons: One carries the infant (in arms or in bassinet insert); one person ventilates the infant; and one carries the oxygen tank.
 2. Using two persons: Either (1) place infant and oxygen tank in bassinet insert, and one person carries bassinet while one person ventilates the infant, or (2) one carries the infant and hand ventilates, and the second person carries the oxygen tank.
- If visitors are present, have them assist in moving supplies or infants.
 - If time permits, the transport equipment is accessible, and the use of the elevator has been authorized, the transport nurse will use the transport incubator to evacuate the sicker, smaller infants.

As soon as the evacuation area is reached, assessment and stabilization should proceed with the designated nursing and medical coordination directing care:

- a. Infants receiving hand ventilation will require gas flow (E- or H-cylinders of oxygen and compressed air) as soon as possible.
- b. Evacuation supplies should be distributed as necessary.
- c. After evacuation is complete, personnel are to remain at the designated evacuation site and are not to return to the evacuated area unless ordered to do so by the Hospital Incident Commander or Fire Department Chief.
- d. During Evacuation, communication between the NICU, Hospital Incident Commander and County Department Emergency Operation Command Center must be taking place.

Transport to Outside Facilities:

- a. Once evacuation is initiated, alternative arrangements for transport of infants to other NICU's should be considered in the event that the NICU cannot be re-populated.
- b. Communication must be established between the Hospital Incident Commander, the County Department Emergency Operation Command Center and the Northern CA Perinatal Transport System:
 - a. Less sick infants can be sent to other Level 2 nurseries in the surrounding area.
 - b. Sicker infants should be sent to other Level 3 nurseries

APPENDIX B

JOB ACTION SHEETS/CARDS MASTER LIST

1. Area/Room Leader (RN).....	61
2. Bedside Nurse (RN).....	62
3. Inpatient Unit Leader (Charge Nurse).....	63
4. Logistics Unit Leader (Relief/Transport RN).....	64
5. Physician Unit Leader (Neonatologist).....	65
6. Respiratory Unit Leader (Respiratory Therapist).....	66
7. Unit Clerical Leader (Secretary/Unit Clerk).....	67

JOB ACTION CARD: Area/Room Leader (RN)

• Prepare infants by affixing ID band to limb.
• Place a patient label directly on each infant's back (skin) and secure with transparent dressing for identification in case the ID band comes off.
• Infants should be wearing hats and wrapped in blankets.
• Place an identifying patient label on each infant's hat and secure with tape (Labor Pool/Ancillary Helpers will assist in carrying supplies, as needed).
• Gather disaster backpacks, patient charts, patient labels and shift kardexes.
• DO NOT EVACUATE WITHOUT AN ORDER AND GUIDANCE FROM THE INCIDENT COMMANDER. If ordered to evacuate the NICU by the Incident Commander: ○ Disconnect as many tubes and wires as possible. ○ Heplock all IV's (including central lines). ○ Disconnect chest tubes from suction and use Heimlich valve.
• Assist others in the room completing tasks on their Job Cards.
• Fill out a HICS Form 260 – Patient Evacuation tracking Form for each patient. A copy must stay with the patient and a copy for each patient in your room is given to the Unit Clerical Leader (Secretary).
• Provide updates regarding your area's progress/status via Nextel phone to Inpatient Unit Leader (Charge Nurse).
• Keep Bedside Nurse in your area updated with information as it comes to you. If you have not heard from the Inpatient Unit Leader (Charge Nurse), try to reach him/her for an update periodically.
• Direct Labor Pool/Ancillary Helpers assigned to your area to gather/carry backpacks, charts and other supplies for evacuation (equipment photos are available in the NICU Disaster Documentation & Forms Go-Kit, if needed to aid Labor Pool/Ancillary Helpers in finding equipment).

JOB ACTION CARD: Bedside Nurse (RN)

• Prepare infants by affixing ID band to limb.
• Place a patient label directly on each infant's back (skin) and secure with transparent dressing for identification in case the ID band comes off.
• Infants should be wearing hats and wrapped in blankets.
• Place an identifying patient label on each infant's hat and secure with tape (Labor Pool/Ancillary Helpers will assist in carrying supplies, as needed).
• Gather disaster backpacks, patient charts, patient labels and shift kardexes.
• DO NOT EVACUATE WITHOUT AN ORDER AND GUIDANCE FROM THE INCIDENT COMMANDER. If ordered to evacuate the NICU by the Incident Commander: ○ Disconnect as many tubes and wires as possible. ○ Heplock all IV's (including central lines). ○ Disconnect chest tubes from suction and use Heimlich valve.
• Fill out a HICS Form 260 – Patient Evacuation tracking Form for each patient. A copy must stay with the patient.

JOB ACTION CARD: Inpatient Unit Leader (Charge Nurse)

Retrieve the NICU Disaster Documentation & Forms Go-Kit from the Charge Nurse desk.
- Pull the following from the Go-Kit: - ALL Job Cards - ALL HICS Forms (214, 254 and 260) - Emergency/Disaster Status Report Form
Use HCIS Form 214 – Operational Activity Log for documenting your actions (i.e., communications, moving patients, etc.)
Direct Unit Clerical Leader (secretary) to notify Medical Director and the NICU Manager on duty of emergency.
Alert Labor and Delivery Charge RN to the situation and request that a hold be placed on non-emergent deliveries (i.e., inductions and repeat cesarean sections).
Obtain 2-way Disaster Radio from Secretary's desk. Upon hearing "CODE TRIAGE" overhead, turn on radio and use for communication with the Hospital Command Center (HCC)
Fill out the Emergency/Disaster Status Report Form and relay information on that form to the HCC by phone, radio, fax or runner.
Assign one Area/Room Unit Leader for Rooms 1, 2/3, 4/5/6 & 7. Give each a Job Card, Downtime Forms and HICS Form 260 – Patient Evacuation Tracking Form (to be filled out on each patient).
Gather and distribute extra Nextel phones (Relief, Tech, RT 2, GSH 2) to Area/Room Leaders and use these phones for communicating.
Distribute remaining Job Cards to Logistics Unit Leader (Relief Nurse), Respiratory Unit Leader (RT) and Unit Clerical Leader (Secretary). Instruct them to follow the steps on the Job Cards.
Consult with the Physician Unit Leader (Neonatologist) to review patients and determine order of potential evacuation based on level of acuity and nature of event. DO NOT EVACUATE WITHOUT AN ORDER AND GUIDANCE FROM THE INCIDENT COMMANDER.
Obtain HICS Form 254 – Master Patient evacuation Tracking Form and Emergency/Disaster Status Report Form. Give to the Unit Clerical Leader (Secretary) and instruct her to follow the steps listed on her card.
Direct Labor Pool helpers/support persons to assist Area/Room Leaders and Logistic Unit Leader (Relief Nurse) in gathering and carrying supplies.
If ordered to evacuate the NICU, bring NICU Disaster Documentation & Forms Go-Kit, Charge Nurse Rand and daily assignment sheet.

JOB ACTION CARD: Logistics Unit Leader (Relief Nurse)

• Distribute portable suction to rooms, if sheltering in place.
• Bring portable suction along, if ordered to evacuate.
• Gather supplies and mobilize additional resources needed for transporting infants.
• Assign Labor Pool/Ancillary Helpers to help gather and carry supplies. Photos of supplies are available in the NICU Disaster Documentation & Forms Go-Kit. Some supplies to consider bringing include: ○ Evacuation Aprons ○ Backpacks ○ Disaster Boxes ○ Oxygen Tanks ○ Portable Suction Machines ○ Blue In-House Transport Bags (Med Room) ○ Transport Medications (Acudose) ○ Bassinets ○ Glucose Meters ○ Transilluminators ○ Baxter Pumps ○ Medfusion Pumps ○ Hospira Pumps ○ Portable Monitors ○ Pulse Oximeters ○ Neopuffs ○ CPAP Machines ○ Available Ventilators ○ Code Cart ○ Lanterns ○ Bath Blankets ○ Baby Blankets ○ Boxes of Non-sterile Gloves ○ Infant Formula (Mostly Enfamil)
• If ordered to evacuate by the Incident Commander, remove breast milk from freezers and put on ice in basins, if time allows.
• Set up alternate care site at the location designated by the Incident Commander and remain there to receive incoming patients.
• Take role of all staff and patients at evacuation site on the Unit Census Sheet as they arrive.

JOB ACTION CARD: Physician Unit Leader (Neonatologist)

- Collaborate with the Inpatient Unit Leader (Charge Nurse) in triaging infants. This will most often be done by acuity and nature of event.

NOTE: DO NOT EVACUATE WITHOUT AN ORDER AND GUIDANCE FROM THE INCIDENT COMMANDER.

- Initiate the neonatologists' emergency call list.
- Assist with stabilization and transport of the sickest infants.

JOB ACTION CARD: Respiratory Unit Leader (Respiratory Therapist)

• Assist with infants on respiratory support.
• Distribute Neopuffs to bedsides of babies on ventilators to be used during evacuation and at the alternate care site.
• Gather/organize E-cylinders and H-cylinders along with regulators to be used during and after evacuation.
• Gather intubation boxes, available ventilators and CPAP Machines to be used at the alternate care site after evacuation.
• <i>IF ORDERED BY INCIDENT COMMANDER OR FIRE MARSHALL OR FIRE CHIEF</i>, shut off gas valves to the NICU.

JOB ACTION CARD: Unit Clerical Leader (Unit Secretary)

• Remain stationed at the desk as long as possible to facilitate communications.
• Notify the Medical Director, Nursing Director and Assistant Managers of the emergency phone numbers found in the NICU Disaster Documentation & Forms Go-Kit.
• Obtain HICS Form 254 - Master Patient Evacuation Tracking Form from the Inpatient Unit Leader (Charge Nurse). Complete by placing patient labels on each sheet or fill them out by hand with patient names. Send copies to the Hospital Command Center (HCC) via phone, fax or send by runner once completed.
• Receive HICS Form 260 – Patient Evacuation Tracking Form from Area/Room Leaders. Send copies to the HCC via phone, fax or send by runner.
• Prepare by gathering the following in case evacuation is ordered: ○ TelephOne rolodex ○ Updated census sheet ○ Binder that contains patient labels ○ Visitor binder that contains family contact information ○ Clipboard with the visitor sign-in sheet
• Act as scribe for forms as directed by Inpatient Unit Leader

APPENDIX C

BIOTERRORISM TREATMENT RESPONSE GUIDELINES TABLE OF CONTENTS

Anthrax.....	69
Botulism.....	72
Brucellosis.....	75
Ebola.....	77
Hemorrhagic Fevers.....	81
Measles*	84
Plague.....	89
Q Fever.....	92
Ricin.....	94
Smallpox.....	96
Staphylococcus Enterotoxin B (SEB).....	99
Tularemia.....	101

*Pandemic; not bioterrorism

TREATMENT RESPONSE GUIDELINES: ANTHRAX

1. Epidemiology

- a. Anthrax in its natural form is a zoonotic infection with a wide distribution in rural areas of the world. The disease is caused by *Bacillus anthracis*, a gram-positive, encapsulated, spore-forming rod. Natural infection in humans occurs via contact with infected animal products. Person-to-person spread is rare, though cutaneous lesions are potentially infectious. Most cases of naturally occurring disease (>95%) is in the form of cutaneous anthrax. The last case of naturally occurring inhalational disease in the US was in 1976. In 2000 and 2001 (prior to 9/11) there was a single case of cutaneous anthrax reported for each year.

2. Incubation

- a. Generally 1-6 days, but can be considerably longer (up to several months).

3. Clinical Manifestations

- a. **Cutaneous:** Development of a painless papule or vesicle with erythema and edema. The lesion will enlarge and ulcerate within 1 to 2 days forming a black eschar. There may be associated fever, malaise and headache.
- b. **Inhalational:** A prodrome of fever, chills and non-productive cough. The disease evolves over the next 2 to 5 days with onset of bacteremia, pleural effusions, mediastinitis, dyspnea, hypoxia, and shock. A widened mediastinum on chest X-Ray is the classic diagnostic finding. This is the most lethal form of disease with death often within 24-36 hours after onset of severe symptoms.
- c. **Gastrointestinal:** Oropharyngeal ulcers, with neck swelling and adenopathy can occur after ingestion of viable Anthrax. Intestinal disease can result in nausea, vomiting, anorexia, fever, ascites and GI hemorrhage.

4. Diagnosis

- a. Gram stain, culture and PCR of blood, pleural fluid, cerebrospinal fluid and cutaneous lesions, or on vesicular fluid, eschar material, oropharyngeal lesions, rectal swabs or stool.
- b. Chest X-ray or CT scan of chest.
- c. Fluorescence, enzyme immunoassay and immunohistochemistry assays.

5. Isolation

- a. Standard precautions.
- b. Contaminated dressings, linens and bedclothes should be incinerated or steam sterilized.
- c. Post mortem exams require special precautions.

6. Case/Fatality Estimates

- a. Cutaneous: <1%.
- b. Inhalational and Gastrointestinal: >50%.
- c. 2001 Data: 11 cutaneous cases with no mortality, 11 inhalational cases with 45% mortality.

7. Treatment: (refer to CDC for most up-to-date guidelines)

a. Post Exposure Prophylaxis (or Mass Casualty Setting):

- i. A high index of suspicion and rapid prophylactic administration of antibiotics is critical.
- ii. Ciprofloxacin and doxycycline are equivalent first line drugs for prophylaxis. Levofloxacin is a second line drug for people over 6 months of age.
- iii. Ciprofloxacin at 30 mg/kg/day divided BID, not to exceed 1000 mg/day. Doxycycline 4.4 mg/kg/day divided BID, not to exceed 100 mg PO BID for a total of 60 days.
- iv. Anthrax Vaccine at 0, 2 and 4 weeks post exposure.

b. Symptomatic Disease:

- i. Ciprofloxacin 400 mg IV every 8-12 hours plus two other antibiotics (rifampin, vancomycin, imipenim, chloramphenicol, penicillin, ampicillin, clindamycin, clarithromycin). Treatment should continue for 60 days.

c. Pediatric Considerations:

- i. Ciprofloxacin, doxycycline and anthrax vaccine are not licensed for children, but in the case of possible exposure, concerns of side effects are outweighed by severity of potential disease. These agents should not be withheld from children in a true exposure event. Substitutions to ciprofloxacin or doxycycline should only

be made when sensitivities to alternative antibiotics (such as penicillin or amoxicillin) are known.

d. Pregnancy Considerations:

- i. There are no reports of vertical transmission of anthrax for cutaneous or GI anthrax.
- ii. There are no reports of inhalational anthrax in pregnancy.
- iii. Concerns of fetal effects are outweighed by severity of disease in cases of high-risk environmental exposure. Ciprofloxacin is the first line drug.

e. Other Considerations:

- i. Cephalosporins and Trimethoprim-sulfamethoxazole are not effective against Anthrax and should not be used.

8. Response Guidelines:

- a. Because naturally occurring Anthrax is exceedingly rare in the U.S., any positive clinical case of environmental PCR hit should be viewed very strongly as a possible terrorist event. Historical data suggests that case fatality rates begin to increase 48 hours after exposure with an exponential increase in deaths with each additional day post exposure.

TREATMENT RESPONSE GUIDELINES: BOTULISM

1. Epidemiology

- a. Botulism is caused by neurotoxins produced by the bacteria, *Clostridium botulinum*. Disease is usually the result of ingesting improperly stored food contaminated by *Clostridium botulinum* spores that have germinated and produced toxin. The average number of food borne cases per year is 17 (2006-2010). Infant botulism (fewer than 100 cases per year) is caused in infants usually less than 6 months of age. The infant ingests viable spores, which remain viable in the immature intestine of the infant and produce toxin. Wound botulism can be associated with crush injuries or severe trauma. Most cases currently are associated with contaminated IV heroin abuse. Most natural outbreaks of food borne botulism occur in small clusters. The other forms occur as sporadic isolated cases. Person-to person spread does not occur.

2. Incubation

- a. **Food Borne:** 6 hours to 8 days (average: 12-48 hours).
- b. **Infant:** 3-30 days.
- c. **Wound:** 4-14 days.

3. Clinical Manifestations

- a. **Food Borne and Wound:** Abrupt onset of flaccid paralysis. Cranial nerves are affected first with rapid progression of descending, symmetric paralysis and respiratory failure. Other findings include ptosis, diplopia, blurry vision, dysphonia, dysphagia, dry mouth and dysarthria.
- b. **Infant:** A more gradual onset of symptoms with constipation, decreased movement, floppy tone, poor feeding, weak cry and loss of facial expression. Rapidly progressing illness can produce apnea and sudden infant death.

4. Diagnosis

- a. Toxin bioassay of serum, stool, gastric aspirate or contaminated foods.
- b. Bacterial culture of stools and suspect foods.

5. Isolation

- a. Standard Precautions.

6. Treatment (refer to CDC for most up-to-date guidelines)

- a. Post Exposure Prophylaxis:

- i. Contact CDC Emergency Operations Center for case consultation: 770-488-7100.
- ii. Immediate administration of antitoxin will halt progression of paralysis but will not reverse existing paralysis.
- iii. Must balance the limited supply of antitoxin and the severity of illness. Limited supplies would be quickly exhausted in a large-scale attack, leaving ventilation and airway protection as the mainstays of therapy.
- iv. Asymptomatic individuals should be closely monitored, near critical care facilities if possible.
- v. Extremes of temperature and humidity will more quickly degrade the toxin.
- vi. Clothing and skin should be washed with soap and water after a known exposure. Contaminated objects and surfaces should be cleaned with 0.1% hypochlorite solution.

b. Symptomatic Disease:

- i. Supportive care: respiratory and nutritional.
- ii. Botulinum antitoxin.

c. Pediatric Considerations:

- i. Botulism Immune Globulin (BabyBIG) licensed for treatment of infant botulism.

d. Other Considerations:

- i. Antibiotics should be avoided (unless necessary) as they may increase toxin release as bacteria lyses.
- ii. Aminoglycosides may potentiate the paralytic effects of the toxin.
- iii. Antibiotics may be administered for wound botulism after antitoxin is given.

7. Response Guidelines

- a. Any widespread outbreak of afebrile, paralytic disease should be investigated as a possible terrorist attack.

- b. All efforts should be made to identify the nature of the threat as soon as possible. Health Care Facilities and providers should be notified as soon as a possible attack is suspected. Because of the rapid onset of clinical symptoms, antitoxin should not be withheld from patients with early neurologic symptoms consistent with botulism while awaiting confirmatory tests.

TREATMENT RESPONSE GUIDELINES: BRUCELLOSIS

1. Epidemiology

- a. Brucellosis is a zoonotic infection caused by various *Brucella* species, which are gram-negative coccobacilli. It is found naturally in wild and domestic animals. Humans are accidental hosts. There are approximately 100 cases per year in the U.S. Infection occurs via inoculation through cuts in the skin, inhalation, ingestion or contact with the conjunctiva. Most cases occur from ingestion of unpasteurized milk or handling infected animals or animal products.

2. Incubation

- a. 1 week to several months (average: 3-4 weeks).

3. Clinical Manifestations

- a. Acute or insidious onset of non-specific, febrile illness with night sweats, malaise, anorexia, aches, abdominal pain, headaches, lymphadenopathy and hepatosplenomegaly. In serious cases, meningitis, endocarditis and osteomyelitis may ensue.

4. Diagnosis

- a. Quantitative serial antibody titers.
- b. PCR (not available in most laboratories).
- c. Culture of blood, bone marrow or other tissues. Samples should be cultured for a minimum of 4 weeks.

5. Isolation

- a. Standard precautions.
- b. Contact precautions if patient has draining wound.

6. Case/Fatality Estimates

- a. Endocarditis occurs in less than 2% of cases, but accounts for most of the fatalities.

7. Treatment: (refer to CDC for most up-to-date guidelines)

- a. Post Exposure Prophylaxis:
 - i. No prophylaxis is recommended for endogenous exposures.
 - ii. For a weaponized attack, 3-6 weeks of Doxycycline plus Rifampin, a Quinolone plus Rifampin, or TMP-SMX plus Rifampin may be effective.

- iii. There is no safe, effective vaccine for human use.
- b. Symptomatic Disease:
 - i. Monotherapy is associated with a high rate of relapse.
 - ii. Oral Doxycycline: 2-4 mg/kg/day (maximum 200 mg/day) in 2 divided doses or Oral Tetracycline 30-40 mg/kg/day (maximum 2 g/day) in 4 divided doses plus Rifampin for 6 weeks is generally recommended.
 - iii. Rifampin should never be given as monotherapy.
 - iv. For serious infections, Gentamicin should be used for the 1st 7-14 days in addition to the six-week course of tetracycline/rifampin combined therapy.
 - v. Much longer courses of antibiotics with combinations of 3 or more drugs are needed for cases of meningitis, osteomyelitis, or endocarditis.
- c. Pediatric Considerations:
 - i. Trimethoprim-sulfamethoxazole should be substituted for Tetracycline and Doxycycline in children less than 8 years of age.

8. Response Guidelines:

- a. All efforts should be made to identify the nature of the threat as soon as possible. The long incubation period gives an ample window of opportunity to determine the true nature of the threat and initiate appropriate therapy. Treatment facilities and health care providers should be alerted to the possibility of an attack with Brucellosis so as to process cultures properly in suspected cases.

EBOLA

The following is intended to give the reader general background information regarding the current Ebola Virus epidemic. These guidelines are the opinions of the Toolkit Authors, based on paucity of scientific evidence, but with biological plausibility. **The reader is strongly advised to review current updates regarding this outbreak as promulgated by the Centers for Disease Control and Prevention, the American Academy of Pediatrics, the California Department of Public Health and the California Health Alert Network.** Selected references and web links are listed below.

1. Epidemiology:

- a. There are five known species of Ebola Virus, four of which cause Ebola Virus Disease (EVD). Initial outbreaks occur presumably via direct contact with infected animals or their fluids. Human to human spread then follows through contact with blood or body fluids of individuals with symptomatic infection. Fomite transmission has been implicated but is not common and very unlikely in clinical settings where cleaning/decontamination is frequent.
- b. Viral load increases significantly as symptoms progress and is very high in deceased individuals.
- c. The current outbreak in West Africa is the largest in history with cases reported in Liberia, Sierra Leone, Guinea, Nigeria, Senegal and Mali. Cases reported outside of Africa have been sporadic and have been in travelers coming from infected regions or health care workers providing direct care to infected individuals.

2. Incubation:

- a. 2-21 days (average 8-10 days)

3. Clinical manifestations:

- a. Fever, headache, aches and weakness
- b. Diarrhea, Vomiting
- c. Hemorrhagic complications
- d. Multi-organ failure and septic shock

4. Diagnosis

- a. Virus can be detected by PCR, viral antigen assay and viral culture.
- b. Ebola virus RNA is usually detectable in blood at the onset of fever and increases logarithmically as disease progresses.
- c. Ebola virus RNA can be detected in saliva, skin (hand swab), breast milk, stool, tears, seminal fluid, vomit, urine and sweat. Elimination of virus during the convalescent phase is variable and has been shown to persist as long as 101 days in semen, 33 days in vaginal fluid, 29 days in stool, 23 days in urine and 15 days in breast milk. This information is based on very small data sets and a longer period of shedding may be possible.

5. Isolation

- a. Standard, contact, and droplet precautions

6. Case/Fatality Estimates

- a. 55-90% depending on outbreak

7. Obstetric and Pediatric Concerns

- a. Limited data suggests that pregnant women have a higher case fatality rate than non-pregnant women. Hemorrhagic complications of the pregnancy are common.
 - i. 1976, Yambuku, Zaire:
 - Overall mortality: 88%
 - Pregnant women: 89%
 - ii. 1996, Kikwit, Democratic Republic of the Congo:
 - Non-pregnant women: 70%
 - Pregnant women: 93%
- b. Infant outcome:
 - i. First and second trimester pregnancies frequently terminate via spontaneous abortion during active maternal Ebola infection.
 - ii. All reported live born infants born to mothers with active Ebola died within 19 days of birth. Chances of survival with access to high-level NICU care can only be speculative.

- c. Breastfeeding:
 - i. Ebola virus has been detected in breast milk.
 - ii. Mothers who develop symptomatic Ebola after the infant is born should be isolated from their infants and not provide breast milk until recovered from illness and milk is determined free of virus.

8. Response guidelines:

- a. Proper isolation of infected individuals and personal safety of those designated to care for the patient is critical. It is critical that staff be trained in proper donning and doffing of personal protective equipment (PPE), that access and traffic around patient care areas be strictly controlled and that proper handling and disposal of contaminated materials be enforced. The most up to date guidelines for use of PPE and infection control are available via the CDC, State and AAP (see reference list, pg. 80).
- b. Given the high case/fatality rate in pregnant women and the very high fetal and neonatal mortality reported, pregnant healthcare providers should not be assigned to care for Ebola patients.
- c. Obstetric staff should take detailed travel and contact histories of all women presenting to labor and delivery. They should maintain heightened awareness of febrile and bleeding complications, as well as high fetal loss risk associated with Ebola.
 - i. Early infection may mimic chorioamnionitis.
 - ii. Early infection may mimic other infections endemic to West Africa (e.g., malaria, typhoid, yellow fever, dengue fever, chikungunya fever).
- d. Any potentially infected mother in labor should be isolated pending diagnosis. NICU staff should be notified well in advance if potentially infected patient is in labor and delivery in order to prepare for proper isolation and protective measures for staff, should delivery of live born infant occur.
- e. Live born infants should be bathed immediately after delivery and placed in isolation away from the mother with active infection. There is little data

regarding transmission risk versus protective effect of breast milk in this situation. It is our opinion that breast milk from actively infected mothers should be withheld from the baby until the mother is recovered and milk is proven free of virus. Donor breast milk is encouraged.

9. References:

- a. Jamieson DJ, Uyeki TM, et al. What obstetrician-gynecologists should know about Ebola. A perspective from the Centers for Disease Control and Prevention. *Obstet Gynecol* 2014;0:1-6.
- b. Peacock G, Uyeki TM, et al. Ebola virus disease in children. What pediatric health care professionals need to know. *JAMA Pediatrics*. 2014. E1-E2
- c. California Department of Public Health. Ebola Virus Disease FAQs. October 20, 2014.
<http://cdph.ca.gov/programs/cder/Pages/Ebola.aspx>
<http://www.cdph.ca.gov/Documents/Ebola%20FAQs.pdf>
- d. Centers for Disease Control and Prevention. Review of human-to-human transmission of Ebola virus.
www.cdc.gov/ebola
<http://www.cdc.gov/vhf/ebola/transmission/human-transmission.html>
- e. Centers for Disease Control and Prevention. Guidance on Personal Protective Equipment to be used by healthcare workers during management of patients with Ebola Virus Disease in U.S. hospitals, including procedures for putting on (donning) and removing (doffing).
<http://www.cdc.gov/vhf/ebola/hcp/procedures-for-ppe.html>
- f. American Academy of Pediatrics. New PPE guidance for health care workers managing Ebola cases.
<http://aapnews.aappublications.org/content/early/2014/10/22/aapnews.20141022-1?papetoc>

TREATMENT RESPONSE GUIDELINES: HEMORRHAGIC FEVERS

1. Epidemiology

- a. The hemorrhagic fever viruses found naturally in the western hemisphere include: Argentinean Hemorrhagic Fever, Bolivian Hemorrhagic Fever, Brazilian Hemorrhagic Fever, Colorado Tick Fever, Dengue Fever, Yellow Fever, Mayaro Fever, Oropouche Virus Fever and Venezuelan Hemorrhagic Fever. All are restricted to Central and South America except Colorado Tick Fever, which occurs in the western U.S. and Canada. Multiple other hemorrhagic fever viruses (Marburg, Ebola, Omsk, Kyasanur, Lassa, Crimean-Congo, Hantaan, Rift Valley) exist worldwide. Knowledge of the geographic distribution of endemic viruses will help differentiate naturally acquired infection from possible terrorist attack.

2. Incubation

- a. Variable

i.	Argentinean	7-14 days
ii.	Bolivian	9-14 days
iii.	Brazilian	7-14 days
iv.	Colorado Tick Fever	1-14 days
v.	Crimean-Congo	3-12 days
vi.	Dengue Fever	2-7 days
vii.	Ebola	3-16 days
viii.	Hantaan	9-35 days
ix.	Kyasanur	3-8 days
x.	Lassa	5-16 days
xi.	Marburg	3-16 days
xii.	Omsk	3-8 days
xiii.	Rift Valley	2-5 days
xiv.	Yellow Fever	3-6 days
xv.	Mayaro Fever	1-12 days
xvi.	Oropouche Virus Fever	2-6 days
xvii.	Venezuelan	7-14 days

3. Clinical Manifestation

- a. Potential manifestations include acute onset of fever, malaise, myalgias, arthralgias, headache, rash, encephalitis, and potential hemorrhagic complications. Patients may also suffer abdominal pain, nausea, vomiting, and diarrhea.

4. Diagnosis

- a. Serology.
- b. Viral culture.

- c. PCR available for some arboviruses.
- d. Clinical microbiology and public health laboratories are not currently equipped to make rapid diagnosis. Specimens should be sent to the CDC or USAMRIID.

5. Isolation

- a. Standard precautions.
- b. Droplet precautions.
- c. Contact precautions.
- d. Negative pressure isolation rooms with HEPA filtration.
- e. PPE including respiratory protection for care givers.
- f. Arenaviruses are infectious as aerosols.
- g. Vector (mosquito/rodent) control.

6. Treatment (refer to CDC for most up to date guidelines)

- a. Post exposure prophylaxis:
 - i. All persons with significant exposure should be placed under medical surveillance for up to 21 days.
- b. Symptomatic Disease:
 - i. Supportive care.
 - ii. Intravenous ribavirin decreases mortality in Lassa fever.
 - iii. Ribavirin may have applications in other HF viruses.
 - iv. Intravenous Ribavirin not commercially available in the United States.
 - v. There is possible efficacy of Interferon in treatment of Rift Valley Fever.
- c. Other Considerations:
 - i. There is a vaccine for Yellow Fever.

7. Pregnancy Considerations

- a. Ribavirin is contraindicated in pregnancy, however should not be withheld when indicated to treat a severely infected pregnant woman.

8. Response Guidelines:

- a. Endemic disease, with the exception of Colorado Tick Fever, does not exist in the U.S. Any case of hemorrhagic fever not associated with travel from an endemic region should be investigated as a possible terrorist attack.
- b. Treatment is supportive and prophylaxis efficacy is speculative. Health care providers should be notified as soon as an attack/outbreak is suspected. If an outbreak is verified, regional vector control measures should be initiated.

TREATMENT RESPONSE GUIDELINES: MEASLES

1. Epidemiology

- a. Measles is caused by Morbillivirus, an enveloped RNA virus. Humans are the only natural host.
- b. Measles is one of the most contagious infections known with transmission occurring by infectious droplets and airborne transmission.
- c. Patients are contagious from 4 days before the rash until 4 days after the rash appears. Immune compromised patients may shed virus longer.

2. Incubation

- a. 8-12 days

3. Clinical manifestations

- a. Prodrome: High fever, cough, coryza, conjunctivitis
- b. Maculopapular rash (3-5 days after onset of prodrome)
- c. Koplik spots
- d. Complications:
 - i. Otitis media
 - ii. Bronchopneumonia
 - iii. Croup
 - iv. Diarrhea

4. Case/Fatality Estimates and Morbidities

- a. Fatalities: 1-3/1000 cases (higher in children < 5 years of age and immune compromised patients)
- b. Acute encephalitis (often with permanent neurologic injury): 1/1000 cases
- c. Subacute Sclerosing Panencephalitis: rare degenerative disease occurring 7-10 years after wild measles infection

5. Diagnosis

- a. Positive measles IgM antibody:
 - i. May be negative in first 72 hours
 - ii. If suspicion high, a second sample should be sent
 - iii. Measles IgM persists for up to one month in unimmunized patients but may not be detectable in partially immunized patients
- b. Acute and convalescent measles IgG antibody showing significant increase in titers
- c. PCR and viral isolation:
 - i. Oropharyngeal and nasopharyngeal swabs are preferred:
 - 1. Highest yield when collected on first day of rash through 3 days following, but may be positive up to 14 days after rash onset.
 - ii. Urine and blood samples may also yield virus.

6. Reporting

- a. Measles is a reportable illness:
 - i. Suspected cases should be reported locally and to the state.
 - ii. Confirmed cases should be reported to the CDC within 24 hours. CDC reporting contact number: 770-488-7100

7. Isolation

- a. Standard precautions
- b. Airborne precautions until 4 days after onset of rash

8. Healthcare providers

- a. Historically health care providers have been implicated in the spread of measles.
- b. Documentation of 2 MMR vaccines should be required of all healthcare workers born after 1957 during a measles outbreak (or demonstration of measles immunity by serology).

- c. Staff born before 1957 are presumed to have had wild-type measles. Measles cases have occurred in this group however and a single dose of measles containing vaccine should be offered.

9. Pregnancy and newborns

- a. Women of child bearing age:
 - i. Women known to be pregnant should not receive MMR vaccine during the pregnancy.
 - ii. Upon completion or termination of pregnancy, non-immune women should be vaccinated against measles before leaving health care facility.
 - iii. Vaccinated women should avoid getting pregnant until 28 days after vaccination.
 - iv. Current data indicates that accidental pregnancy after MMR vaccine should NOT be considered an indication to terminate the pregnancy.
- b. Infants:
 - i. Infants are generally protected from maternal antibodies if the mother has measles immunity.
 - ii. Duration depends on degree of maternal antibody (higher after wild-type measles) and infants gestational age at birth:
 - 1. Current data suggests that 7% lack measles antibodies at birth and 90% are seronegative by 6 months.
 - 2. Vaccination of siblings, parents and other household members is critical to provide herd immunity for these vulnerable infants.

10. Family and visitation

- a. NICUs and newborn nurseries should adopt strict visitation guidelines during a measles outbreak:
 - i. Siblings, grandparents born after 1957 and designated support persons should have proof of vaccination for visitation.

- ii. Close family members with incomplete vaccination status should be strongly urged to get catch up vaccines to provide herd immunity for the family.
- iii. Visitors with URI symptoms should be excluded:
 - 1. Parents of NICU patients should observe strict respiratory precautions and hand hygiene if URI symptoms.
 - 2. If parents have a febrile URI and undocumented measles immunity it is advised to rule out measles before allowing parental visitation.

11. Response guidelines

- a. Post exposure vaccination within 72 hours of exposure can be offered to susceptible patients as young as 6 months old:
 - i. MMR cannot be given to NICU patients.
 - ii. MMR should not be given to pregnant women and women who receive MMR should avoid getting pregnant for at least 28 days due to theoretical risk of fetal infection.
- b. Immune globulin (given IM) or IVIG will likely contain antibodies against measles and can be given up to 6 days after exposure:
 - i. Immune Globulin dose:
 - 1. 0.25 ml/kg
 - 2. 0.5 ml/kg if immune compromised:
 - a. CDPH recommends this dose for all infants <12 months.
 - b. Some ID experts recommend this dose for all given the decreased pooled antibody titers among donors in the vaccination era. Titers are higher after wild-type measles infection.
 - 3. Max dose: 15 ml
 - ii. IVIG: 400 mg/kg

1. CDPH recommends IVIG for post exposure prophylaxis of pregnant women without evidence prior immunity.
- c. Vitamin A supplementation has been shown to decrease mortality by up to 50% in developing countries and can also prevent co-morbidities such as blindness. Vitamin A should be administered to patients with measles:
 - i. Dose:
 1. Infants < 6 months old: 50,000 IU/dose Q day x 2 days
 2. Infants 6 months-12 months: 100,000 IU/dose Q day x 2 days
 3. Children > 12 months: 200,000 IU/dose Q day x 2 days

12. References:

- a. McLean HQ, Fiebelkor AP, et al. Prevention of measles, rubella, congenital rubella syndrome and mumps, 2013: Summary recommendations of the advisory committee on immunization practices (ACIP). *MMWR*. June 14, 2013; 62(RR04):1-34.
- b. 2012 Report of the Committee on Infectious Disease (AAP Redbook); pp 489-499.
- c. CTSE List of Nationally Notifiable Conditions, August 2012
- d. CDC Fact sheet: Specimens for detection of Measles RNA by RT-PCR or Virus isolation
- e. CDC fact sheet: Measles for Healthcare Professionals
- f. World Health Organization Measles Fact Sheet (Fact Sheet N286); Updated November 2014
- g. California Department of Public Health, Measles Investigation Quicksheet: August 2013

TREATMENT RESPONSE GUIDELINES: PLAGUE

1. Epidemiology

- a. Plague is a zoonotic infection found naturally in rodents, carnivores and fleas. It is endemic to rural southwest U.S. with episodic single cases or small cluster outbreaks. Plague is caused by a pleiomorphic, gram-negative coccobacillus, *Yersinia Pestis*.

2. Incubation

- a. 2-8 days for bubonic plague; 106 days for pneumonic plague.

3. Clinical Manifestations

- a. **Bubonic:** Acute onset of fever and swollen, painful lymph nodes (buboes). Buboes develop most commonly in the inguinal, axillary and cervical nodes.
- b. **Septicemic:** DIC, respiratory distress and circulatory collapse.
- c. **Pneumonic:** Cough, fever, dyspnea and hemoptysis.

4. Diagnosis

- a. Characteristic “safety pin” appearance on Gram stain or Wayson Stain.
- b. Fluorescent antibody tests on bubo aspirate, sputum blood or CSF.
- c. Enzyme immunoassay or serology titers.
- d. PCR.
- e. Blood, CSF, bubo aspirate culture.

5. Isolation

- a. **Bubonic Plague**-Standard precautions.
- b. **Pneumonic Plague**- Respiratory droplet precautions for 48 hours from initiation of appropriate antibiotics.
- c. **Lab Personnel:** Lab personnel should be notified if *Yersinia* suspected to initiate appropriate precautions.

6. Case/Fatality Estimates

- a. **Bubonic:** 50% mortality in untreated cases.
- b. **Pneumonic:** Near 100% mortality in untreated cases.

7. Treatment (refer to CDC for most up to date guidelines)

a. Post Exposure Prophylaxis (or Mass Casualty Setting):

- i. Doxycycline 100 mg PO BID or Ciprofloxacin 500mg PO BID for 7 days.
- ii. Tetracycline or Chloramphenicol is accepted alternatives.
- iii. There is no commercially available *Y pestis* vaccine currently available in the U.S.

b. Symptomatic Disease:

- i. Treatment should be initiated within 24 hours of onset of symptoms. Failure to do so in Pneumonic Plague results in near 100% fatality.
- ii. Preferred parenteral antibiotics include streptomycin or gentamicin. Alternatives include ciprofloxacin, tetracycline, doxycycline (which should also be given intravenously) or chloramphenicol, which may be given PO.

c. Pediatric Considerations:

- i. Streptomycin or gentamicin is the initial treatment of choice for children with symptomatic disease. For patients over 8 years of age, post exposure prophylaxis is provided by either doxycycline or ciprofloxacin. For patients under 8 years, doxycycline, tetracycline, chloramphenicol, ciprofloxacin or trimethoprim-sulfamethazole are appropriate alternative drugs. The high risk of severe illness should override concerns of side effects in the pediatric age group.

d. Pregnancy Considerations:

- i. In the event of a high-risk exposure, gentamicin is recommended for prophylaxis in pregnant women.

8. Response Guidelines:

- a. Naturally occurring plague is usually spread by fleabites and manifests in all three clinical forms. Weaponized plague is likely to manifest solely as pneumonic plague. The incubation period is short and onset of fulminant disease is rapid. Ideally, antibiotics should be initiated within 24 hours of onset of clinical symptoms.
- b. Health care providers should be notified within 24 hours of initial surveillance positive hit so as to alert to possible clinical cases. All efforts

should be made to identify the nature of the threat within 48 hours of initial suspicion. In the event that the nature of the threat is still unclear at 48 hours, a 7-day course of antibiotic prophylaxis of at-risk populations should be initiated.

TREATMENT RESPONSE GUIDELINES: Q FEVER

1. Epidemiology

- a. Q fever is a worldwide zoonotic infection caused by the Legionella-like, Gram negative, intracellular bacterium, *Coxiella burnetii*. It is found naturally in a wide range of wild and domestic animals. Infected animals are usually asymptomatic. Humans are accidental hosts and acquire infection by inhalation of dust contaminated by animal parturition fluids or inhalation of aerosolized particles from the same fluids. Airborne particles can be carried on the wind to distances of a half-mile or more. There is no person-to-person spread of infection.

2. Incubation

- a. 9-39 days (average: 14-22 days)

3. Clinical Manifestations

- a. Asymptomatic:
 - i. 60% of initial infections
- b. Acute:
 - i. Abrupt onset of fever, chills, weight loss and headache
 - ii. Cough, chest pain, pneumonia in 20-40%
 - iii. Hepatitis in 40-60%
 - iv. Spontaneous resolution in 1-4 weeks
 - v. Rare cases of encephalitis or myocarditis
- c. Chronic:
 - i. 1 % of acutely infected patients develop chronic disease
 - ii. Chronic endocarditis (patients with heart disease, prosthetics or aneurysms), chronic osteomyelitis or chronic hepatitis

4. Diagnosis

- a. Blood culture poses a high hazard to lab workers and is usually not attempted
- b. Quantitative serial antibody titers with fourfold increase
- c. PCR
- d. Immunostaining of tissue (i.e. heart valve)

5. Isolation

- a. Standard precautions

6. Case/Fatality Estimates

- a. Rare fatalities overall
- b. Cases with chronic endocarditis have a 10% fatality rate
- c. Q fever during pregnancy can result in spontaneous abortion or preterm delivery

7. Treatment (refer to CDC for most up-to-date guidelines)

- a. Post Exposure Prophylaxis:
 - i. Doxycycline or tetracycline started 8-12 days post exposure and continued for 5-7 days may be considered
- b. Symptomatic Disease:
 - i. Most patients recover without therapy
 - ii. Antibiotics will hasten recovery:
 - 1. Doxycycline is the treatment of choice: 2 mg/kg every 12 hours (maximum 100mg/dose)
 - 2. Q fever endocarditis is treated with doxycycline plus hydroxychloroquine
- c. Pediatric and Pregnancy Considerations:
 - i. For children under 8 years of age and for pregnant women, trimethoprim-sulfamethoxazole may be substituted for doxycycline
- d. Q fever vaccines are not licensed in the United States

8. Response Guidelines:

- a. All efforts should be made to identify the nature of the threat as soon as possible. The long incubation period and low case/fatality ratio gives an ample window of opportunity to determine the true nature of the threat and initiate appropriate therapy. Treatment facilities and health care providers should be alerted to the possibility of an attack with Q fever so as to help in making the diagnosis in clinical cases.

TREATMENT RESPONSE GUIDELINES: RICIN

1. Epidemiology

- a. Ricin is a leftover waste product from castor beans in the production of castor oil. It can be in the form of a powder, a mist, and a pellet or dissolved in solutions of water or acid. It is very stable in the environment at extremes of temperature. Ricin causes injury and illness when inhaled or ingested. Ingestion of contaminated food or water leads to severe GI symptoms, shock, cardiovascular collapse and death. Because symptoms are caused by direct effect of the toxin, there is no role for antibiotics for prophylaxis or treatment.

2. Clinical Manifestations

- a. Inhalation:
 - i. Fever, chest tightness, dyspnea, cough, nausea and arthralgias within 4-8 hours. Severe respiratory symptoms and respiratory failure within 8 hours of inhalation. Airway necrosis and pulmonary edema 18-24 hours after exposure. Death within 36-72 hours.
- b. Gastrointestinal:
 - i. Severe GI symptoms, shock and death.

3. Diagnosis

- a. Serum and respiratory secretions for EIA.

4. Isolation

- a. Standard precautions.

5. Case/Fatality Estimates

- a. Case/fatality rates depend on the route of exposure and the total dose received. If death does not occur within the first 3 to 5 days, the victim generally survives.

6. Treatment (refer to CDC for most up-to-date guidelines)

- a. Post Exposure Prophylaxis:
 - i. None once exposure occurs
 - ii. Protective masks if not yet exposed and in the hot zone
 - iii. The most important factor is getting Ricin off or out of the victim as soon as possible. Rinse the eyes thoroughly with water and remove contact lenses if the eyes are irritated from an aerosol

exposure. Remove clothing and rapidly wash skin with soap and water to physically remove agent.

- b. Symptomatic Disease:
 - i. Thorough DECON for aerosol attack
 - ii. Supportive
 - iii. Gastric lavage and cathartics for ingestion
 - iv. Charcoal not effective due to the large molecular size of Ricin

7. Response Guidelines:

- a. Rapid onset of an acute lung injury with rapid progression to critical condition and death occurring simultaneously in a large segment of the population would suggest an aerosol attack with Ricin. Sudden onset of GI symptoms with rapid progression to shock and death in a large segment of the population would suggest an attack on the water or food supply.
- b. All efforts should be made to identify the nature of the threat as soon as possible. Rapid progression of disease should enable early verification of initial suspicion. Notification of health care facilities and first responders should be made as soon as there is suspicion of a Ricin attack so as to prepare DECON capability.

TREATMENT RESPONSE GUIDELINES: SMALLPOX

1. Epidemiology

- a. Smallpox is caused by the variola virus. The last naturally occurring case of smallpox was in Somalia in 1977, with 2 lab-acquired cases reported in 1978. WHO declared smallpox eradicated in 1980. Most people under the age of 35 have no immunity. Patients are not contagious during incubation. Transmission occurs primarily by droplets from the oropharynx. Patients become infectious with the development of mucosal lesions (enanthemas). These lesions occur within hours of the rash formation. Patients are contagious until all scabs have separated.

2. Incubation

- a. Averages 12 days (range: 7-17 days)

3. Clinical Manifestations

- a. Severe prodrome of fever to 102-104F, with associated headache, backache, abdominal pain, malaise and prostration lasting 2-5 days
- b. The prodrome is followed by development of enanthemas and then rash within 24 more hours
- c. Eruptions start on the face and extremities and spread centrally. Lesions progress from macules to papules to vesicles. All lesions tend to be in the same stage at the same time

4. Diagnosis

- a. PCR of pustules or vesicles for definitive diagnosis
- b. Electron microscopy, culture and immunohistochemistry can detect general orthopoxvirus species

5. Isolation

- a. Standard contact and airborne precautions
- b. Suspected patients should be placed in isolation rooms with negative pressure and HEPA filtration. Patient care providers should wear N95 or higher quality respirators, gloves and gowns
- c. Body wastes, bedding and clothing treated as biohazard

6. Case/Fatality Estimates

- a. Historically about 30% case/fatality rates

- b. Children under 1 year and adults older than 30 years are at greatest risk
- c. Hemorrhagic smallpox and flat smallpox has 100% fatality

7. Treatment (refer to CDC for most up to date guidelines)

- a. Post Exposure Prophylaxis:
 - i. Post exposure vaccination with Vaccinia vaccine within 3-5 days of exposure during the infectious stage
 - ii. Vaccinia Immune Globulin (VIG) is reserved for treating vaccine complications and has no role in the treatment of smallpox
- b. Symptomatic Disease:
 - i. Supportive care
 - ii. Efficacy of Cidofovir therapy unknown
- c. Vaccinia Vaccine Contraindications:
 - i. Atopic dermatitis or other exfoliative skin disease
 - ii. Pregnant women or those who intend to become pregnant
 - iii. Any immunocompromised patient
 - iv. **Note: In the event of a true smallpox outbreak, the risks associated with vaccination are less than those associated with smallpox infection.**
- d. Pediatric Considerations:
 - i. Pre-exposure vaccination in children not recommended
 - ii. Vaccination is not contraindicated after exposure to an intentional attack or index case
- e. Pregnancy Considerations:
 - i. Pregnant women have a higher case/fatality rate than the general population
 - 1. Pregnant women have a seven fold increased risk of hemorrhagic smallpox
 - 2. Preterm delivery, stillbirths and rates of SAB are very high in cases of pregnant women with smallpox
 - 3. Congenital variola has been reported

- ii. Fetal vaccinia has been reported following vaccination of pregnant women
 - 1. Pregnancy is a contraindication to non-emergent vaccination
 - 2. Pregnancy is not a contraindication to vaccination after exposure to an intentional attack or index case

8. Response Guidelines:

- a. Any confirmed case of smallpox should be considered an attack until proven otherwise.
- b. Ideally, vaccination of at-risk personal should be initiated within 3-5 days of the initial exposure. Persons not exposed during the primary attack will not be at risk for secondary infections unless exposed to individuals with active oral lesions or rash.
- c. In the case of a proven outbreak/attack with smallpox, outbreak-specific vaccine guidelines should be obtained from the CDC.

TREATMENT RESPONSE GUIDELINES: **STAPHYLOCCOCAL ENTEROTOXIN B (SEB)**

1. Epidemiology

- a. Aerosolized endotoxin from the staphylococcus bacteria could feasibly be used in a terrorist attack. Because symptoms are caused by direct effect of the toxin, there is no role for antibiotics for prophylaxis or treatment.

2. Incubation

- a. Symptoms occur 3-12 hours after aerosol exposure.

3. Clinical Manifestations

- a. Disease presents with sudden onset of fever, chills, headache, myalgias and non-productive cough, and often with nausea, vomiting and diarrhea as well. Some patients may develop significant lung disease and respiratory failure. Inhalation exposure results in more respiratory complaints and eye irritation, whereas ingestion leads to more gastrointestinal symptoms. Disease peaks rapidly, with fever lasting 2-5 days. Cough may persist up to 4 weeks.

4. Diagnosis

- a. Toxin detection in serum, urine and respiratory secretions
- b. Acute and convalescent antibody serology

5. Isolation

- a. Standard precautions

6. Case/Fatality Estimates

- a. Rarely causes death, but is significantly incapacitating

7. Treatment (refer to CDC for most up-to-date guidelines)

- a. Post Exposure Prophylaxis:
 - i. None
- b. Symptomatic Disease:
 - i. Supportive

8. Response Guidelines:

- a. Rapid onset of an acute febrile illness with respiratory compromise occurring simultaneously in a large segment of the population would suggest an aerosol attack with SEB.

- b. All efforts should be made to identify the nature of the threat within as soon as possible, but there is no critical window as prophylaxis is not feasible and treatment is supportive.

TREATMENT RESPONSE GUIDELINES: TULAREMIA

1. Epidemiology

- a. Tularemia is a zoonotic infection caused by *Francisella tularensis*, a gram-negative coccobacillus. It is found in approximately 100 different species of wild animals, some domestic species and parasitic arthropods. In the U.S., ticks and rabbits are the primary source of naturally acquired infection. Infection is usually caused by tick bite or handling infected animals or animal products. Person-to-person spread does not occur.

2. Incubation

- a. Generally 3-5 days, but may range 1-21 days

3. Clinical Manifestations

- a. **Ulceroglandular:** Development of a painful maculopapular lesion at the portal of entry. This eventually ulcerates with slow subsequent healing. There is associated regional lymphadenopathy, fever, chills, headache and malaise. Lymphadenopathy with systemic symptoms may occur without the primary ulcerative lesion.
- b. **Typhoidal:** Septicemia with fever, headache, prostration, weight loss, hepatomegaly and splenomegaly.
- c. **Pneumonic:** Fulminant, atypical pneumonia with substernal discomfort and a non-productive cough. There is a high case fatality rate. This is the most likely presentation following a weaponized attack. It can be primary or follow the initial onset of glandular or typhoidal disease.

4. Diagnosis

- a. Quantitative serology testing. Most patients will not develop antibodies until the second week of illness
- b. PCR or fluorescent antibody testing of ulcer exudates or aspirates (limited availability)
- c. Culture of blood, skin, ulcers, lymph node drainage, gastric aspirates or sputum grown in cysteine-enriched media

5. Isolation

- a. Standard precautions
- b. Laboratory acquired infection possible. Lab workers should wear protective masks and gloves and use a biologic safety cabinet

6. Case/Fatality Estimates

- a. Highest for pneumonic tularemia.

7. Treatment (refer to CDC for most up to date guidelines)

- a. Post Exposure Prophylaxis:
 - i. Ciprofloxacin or Doxycycline is recommended
 - ii. Antibiotic prophylaxis should ideally be initiated within 24 hours of exposure and continued for 14 days
- b. Symptomatic Disease:
 - i. Streptomycin or Gentamicin for at least 10 days (longer in severe cases). Doxycycline and Ciprofloxacin are alternative agents
- c. Pediatric Considerations:
 - i. Ciprofloxacin is not approved for patients less than 18 years of age. Doxycycline is not recommended for children less than 8 years of age. These agents should not be withheld from children in a true exposure event when the risk of disease outweighs the relative risk of antibiotic side effects and there are no appropriate alternative antibiotics.
- d. Pregnancy Considerations:
 - i. Risks of fetal effects of therapy are usually offset by risk of untreated disease
 - ii. Ciprofloxacin recommended for prophylaxis. Gentamicin recommended for treatment of disease

8. Response Guidelines:

- a. An attack with Tularemia should be suspected if there is a large cluster of clinical cases with sudden onset fever, malaise, headache and non-productive cough or if multiple cases of pneumonic tularemia are verified.
- b. Health care providers should be notified within 24 hours of an initial surveillance hit so as to alert to possible clinical cases. Lab personnel should be notified at the same time so as to initiate protective measures when handling specimens.
- c. All efforts should be made to identify the nature of the threat within 24 hours of initial suspicion. In the event that the nature of the threat is still unclear at 24 hours an initial prophylaxis plan can be initiated. It is

reasonable to distribute a 3-5 day supply of antibiotics to the at-risk population while the nature of the threat is further elucidated. If a true exposure is subsequently verified, a full 14-day course of post exposure antibiotic prophylaxis should be provided to the at-risk population.

Appendix D

Pre-Disaster Critical Infrastructure Self-Assessment*

*U.S. Department of Health and Human Services, Agency of Health Care Research and Quality, Hospital Evacuation Decision Guide, 2011

Evacuation-Relevant Resources	Implication
City Water	
Is water used for heating the hospital?	
Is water used for cooling?	Y = more vulnerable
Does the hospital have a well?	Y = more vulnerable
Is there one water line going into the hospital, or also a backup line?	N = more vulnerable; only 1 = more vulnerable
Is there a water storage tower/tank on the roof?	Y = more vulnerable to earthquakes (but good backup water source)
If the water tower/tank collapsed, would the hospital then be without water (or sufficient pressure?)	Y = more vulnerable
How long can the hospital maintain a safe temperature without city water in summer heat?	Hours = time until evacuation
How long can the hospital maintain a safe temperature without city water in winter cold?	Hours = time until evacuation
Steam	
Does the hospital receive steam for heat from a separate steam-generation plant?	
Is that steam plant on the hospital premises?	Y = more vulnerable
Is there one steam line into the hospital, or also a backup conduit?	N = more vulnerable; only 1 line = more vulnerable
How long can the hospital maintain a safe temperature if the steam-generation plant is off-line?	Hours = time until evaluation
Is steam also used to generate electricity?	Y = more vulnerable

If so, what % of electricity would be lost if the steam-generation plant went offline?	>50% = vulnerable
Electricity	
Does the hospital have a central backup generator?	N = more vulnerable
More than 1 back-up generator?	N = more vulnerable
Is there fuel storage tank on site with a direct line to the backup generator?	N = more vulnerable
Is the fuel storage tank underground?	Y = more vulnerable
In a flood, would the intake be under water?	Y = more vulnerable
How long can essential power be maintained using the current fuel supply?	Hours = time until evacuation
Does the hospital have smaller or portable generators for floors/sections of the hospital?	N = more vulnerable
Can all the essential areas of the hospital be powered with these smaller generators?	N = more vulnerable
Is fuel stored on site for these smaller generators?	N = more vulnerable
How long can essential power be maintained using the current fuel supply and these smaller generators?	Hours = time until evacuation
Natural Gas	
Is the boiler or other heating equipment fired by natural gas?	
Is there one gas line into the hospital, or also a backup line?	Only 1 = more vulnerable
How long can the hospital maintain a safe temperature without a boiler in winter cold?	Hours = time until evacuation
Boilers/Chillers	
Does the hospital have backup/redundant boilers?	N = more vulnerable
Does the hospital have backup/redundant chillers?	N = more vulnerable

How long can the hospital maintain a safe temperature without the chiller in summer heat?	Hours = time until evacuation
How long can the hospital maintain a safe temperature without the boiler in winter cold?	Hours = time until evacuation
Powered Life Support Equipment	
On a typical weekday, how many patients are on ventilators or other powered life-support equipment (including incubators and ventilators)?	<10 _____ 11-25 _____ 26-50 _____ 51-100 _____ 100+ _____
Does each of these ventilators or other pieces of equipment have a battery pack?	N = more vulnerable
What is the average battery life per ventilator/equipment?	Hours = time until evacuation
How many patients are otherwise oxygen dependent?	<10 _____ 11-25 _____ 26-50 _____ 51-100 _____ 100+ _____
Does the medical gas system rely on electricity?	Y = more vulnerable
If the medical gas system fails, how long can these patients be maintained using the current stock of portable/backup oxygen?	Hours = time until evacuation
Information Technology and Telecommunication	
Are servers and other telecommunication systems on the hospital premises or offsite?	On premises = more vulnerable
Are redundant hardware and software systems deployed offsite?	N = more vulnerable
Are critical databases (e.g., EMRs) managed or back up offsite?	N = more vulnerable
Can the EMR quickly generate patient discharge summaries to accompany each evacuated patient?	N = more vulnerable

Can manual, paper-based backup systems and procedures be rapidly reconstituted (e.g., manual order entry, manual medication dispensing), and has staff been trained to safely use these systems.	N = more vulnerable
Does the hospital have VOIP capabilities or two-way radios that interoperate with local emergency responders?	N = more vulnerable
Security	
Does the hospital employ its own security staff or contract with an outside security firm?	Own staff _____ Contracted _____
Is sufficient security staff on site during every shift (including nights and weekends) so that two can be stationed at every entrance/exit?	N = more vulnerable
Can sufficient additional security staff be brought in to escort/guard transport vehicles?	N = more vulnerable
Does the hospital evacuation plan assume that municipal or State police will be available to assist?	Y = more vulnerable