

# Disaster Planning: Healthcare Facilities

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## Objectives

- Identify types of natural & man-made disasters & resulting infection control issues
- Identify components and purpose of an effective Emergency Operations Plan
- Provide references & resources for the development of an infection control disaster Emergency Operations Plan

# Why do we plan.....

## Climate patterns change wildly

*La Niña creating drought in Midwest, South; more hurricanes in other places*

By **IRA DREYFUSS**  
*Associated Press*

WASHINGTON — Al Dutcher, Nebraska's state climatologist, doesn't wish any hard luck on West Texas. Just the same, it would be a relief for Nebraska if a hurricane from the Gulf of Mexico tracks lots of rain northward into his drought-stricken state.

"We don't pray for a hurricane," Dutcher said. But he knows exactly where one ought to hit: "It has to be in the Brownsville area, and Amarillo, and pull into our area."

Dutcher's dilemma illustrates something about the nature of climate patterns that have created the worst drought in a century or more in some areas from Nebraska into Texas and Florida.

In weather, everything is connected, and changes as far from the United States as the Pacific Ocean off Peru can wind up literally hitting

gia drought area.

The combination of dry air and heat as spring wears into summer will add to the soil evaporation that has left ground hard as pavement and riddled with cracks. Worse, for farmers who managed to plant, La Niña's dry winter has kept the subsoil from capturing the normal reserve of water into which maturing crops extend their roots.

### Hurricane cycles

In the Lubbock, Texas, area, farmers were able to get cotton planted in irrigated land or through the good fortune of some timely storms, said Randy Boman, a Texas A&M Extension cotton agronomist. But the ground below the topsoil is dry, and this could stunt growth, he said.

Like Dutcher, Boman is mulling the good that a hurricane or two could do. "At this stage of the game, it would be a tremendous benefit to us, as long as it didn't set on us for

too many days," he said.

Paradoxically, La Niña could raise the likelihood of the big storms, climate experts say.

Among the Pacific-born weather pattern's effects is a more favorable mid-level jet stream from Africa, where hurricanes are born.

The jet stream energizes developing storms. And researchers at Florida State University, who say hurricanes have their own cycles, believe the country has started a period of more frequent hurricanes.

But, with weather, you have to be careful what you wish for.

Hurricanes usually become more common in the later summer. Farmers in Boman's area plant cotton capable of standing up to High Plains winds, Boman said. But a hurricane blasting through at harvest time, he added, could cost cotton farmers their crops.

# Sumter Regional Hospital 2-29-07



**Around 55 patients in the hospital had to be evacuated, three were in critical condition.**

**No patients died**



# Katrina: New Orleans, August 2005



## Dermatologic Illnesses – Hurricane Katrina, 2005

### Evacuees:

- Cluster of MRSA infections (30 cases)
- *V. vulnificus* & *V. parahaemolyticus* wound infections (24 cases) – 6 deaths

### Rescue workers:

- Tinea Corporis
- Folliculitis
- Prickly heat (3 cases)
- Non-follicular lesions (97 cases)
- Circumferential lesions (chafing)

MMWR 54:38, 961-964

## Diarrheal Illnesses – Hurricane Katrina, 2005

- La: 20 clusters
- MS & TX: ~1000 cases (Norovirus, *Salmonella*, *V. cholerae* O1)

MMWR 54:38, 961-964

# Respiratory Illnesses – Hurricane Katrina, 2005

- URI, pneumonias
- 1 case of pertussis
- 1 new diagnosis of pulmonary TB
- Of 195 known persons with TB, 153 located to continue DOT

MMWR 54:38, 961-964

## NC FEMA Major Disaster Declarations 1996-2005

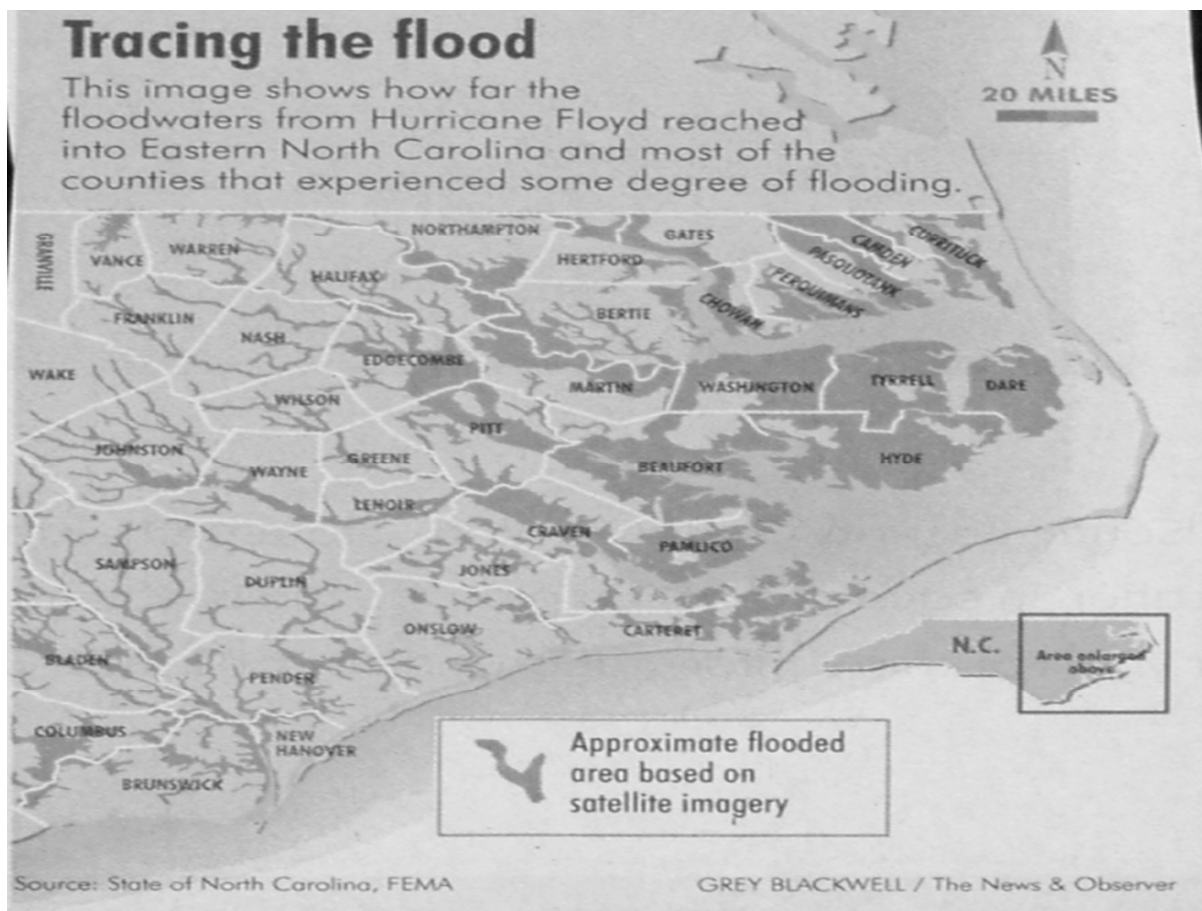
Year	Date	Disaster Types
2005	10/7	Hurricane Ophelia
2004	9/18	Hurricane Ivan
2004	9/10	Tropical Storm Frances
2003	9/18	Hurricane Isabel
2003	3/27	Ice Storm
2002	12/12	Severe Ice Storm
2000	1/31	Winter Storm
1999	9/16	Hurricane Floyd & Irene
1999	9/9	Hurricane Dennis
1998	8/27	Hurricane Bonnie
1998	3/22	Severe Storms, Tornadoes and Flooding
1998	1/16	Flooding
1996	9/6	Hurricane Fran
1996	7/18	Hurricane Bertha
1996	2/23	Storms/Flooding
1996	1/13	Blizzard

# Ivan: Asheville, September 2004



## Hurricane Floyd

- September 16, 1999
  - 300 miles diameter
  - 96-100 miles per hour wind
  - >20 inches of rain
  - affected 2.1 million persons



## Deaths Related to Hurricane Floyd North Carolina - 1999

Cause of Death	Number (n=52)	(%)
Drowning	36	(69)
Motor-vehicle crash	7	(13)
Myocardial infarction	4	(8)
Fire	2	(4)
Hypothermia	1	(2)
Electrocution	1	(2)
Fall	1	(2)

MMWR Vol 49, no 17, p 369-372

# Non-fatal Illnesses

## Hurricane Floyd 1999

- ↑asthma [RR] 1.4, 95% CI 1.2-1.7
- ↑diarrhea [RR] 2.0, 95% CI 1.4-2.8
- ↑suicide attempts [RR] 5.0, 95% CI 1.4-17.1
- ↑dog bites [RR] 4.1, 95% , CI 2.0-8.1
- ↑febrile illnesses [RR] 1.5, 95% CI 1.3-1.9
- ↑basic medical needs [RR] 1.4, 95% CI 1.2-1.8
- ↑dermatitis [RR] 1.4, 95% CI 1.2-1.6
- ↑arthropod bites [RR] 2.2, 95% CI 1.4-3.4

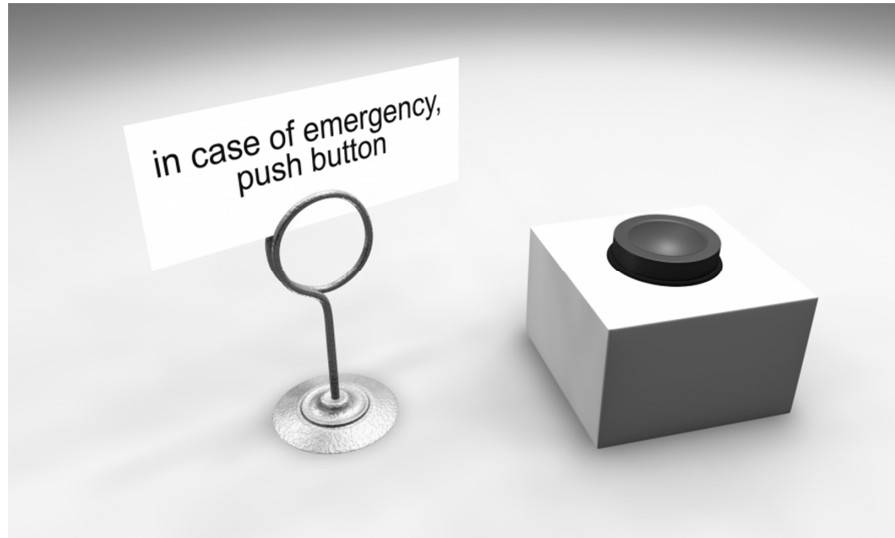
MMWR 49:17, p 369-372

## We Plan Because....

- It is our obligation to the people of North Carolina
- Regulatory and accreditation agencies mandate it
- And.....

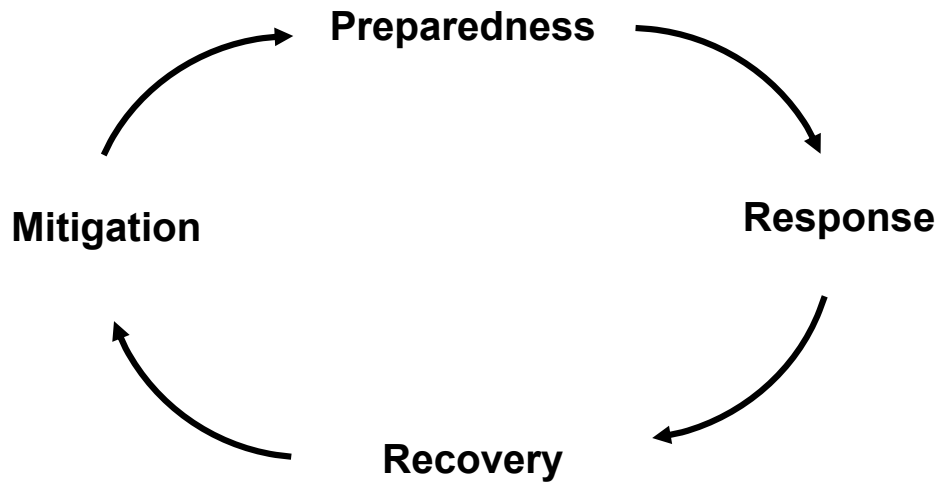


Because there is no such thing as  
an **EASY BUTTON**® for Disasters  
or Emergencies!

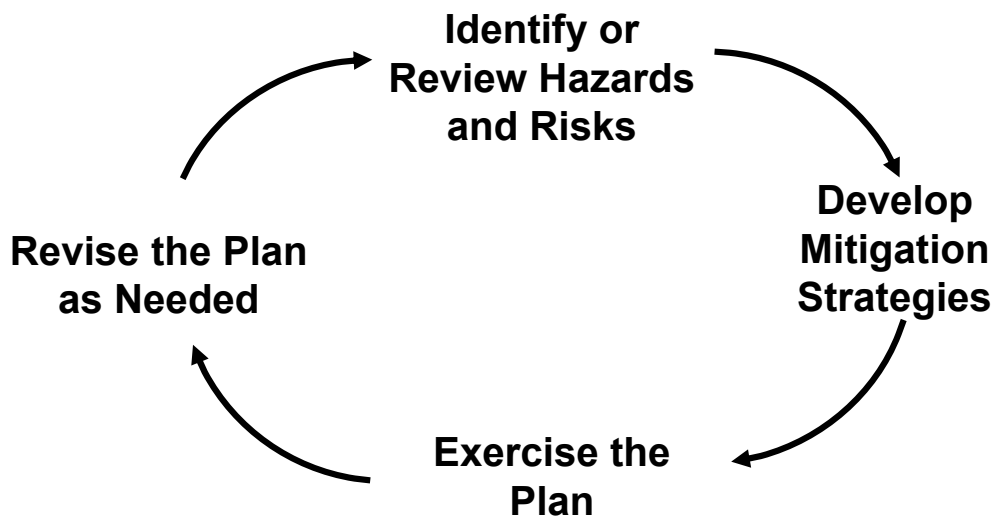


## Emergency Management Phases and Planning Cycles

# Emergency Management Phases



# Emergency Planning Cycle



# What is the Purpose of Emergency Operations Planning?

## The Purpose of Emergency Operations Planning

- Establish a flexible all-hazards response and recovery framework that can reach across disciplines
- Establish a common operating picture
- Integrate plans and policies internally and externally with other organizations and agencies

# Regulation-based Planning vs. Hazard-based Planning

## Regulation-based Planning

- Based on regulations that control certification, accreditation, and funding
- Provides program guidance and management rather the Emergency Operations Planning



# Hazard-based Planning

- Based on a Hazard Vulnerability Analysis
- Provides function plans that incorporate multiple hazards along with the appropriate standards
- Proactive and Reactive



## Hazard Vulnerability Analysis (HVA)

- 1<sup>st</sup> step in the emergency planning process
- Matrix that compares the likelihood and impact potential of a particular hazard or threat against the level of preparedness
- Community input is essential

EVENT	PROBABILITY	HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPAREDNESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	RISK
	<i>Likelihood this will occur</i>	<i>Possibility of death or injury</i>	<i>Physical losses and damages</i>	<i>Interruption of services</i>	<i>Preplanning</i>	<i>Time, effectiveness, resources</i>	<i>Community/Mutual Aid staff and supplies</i>	<i>Relative threat*</i>
SCORE	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = High 2 = Moderate 3 = Low or none	0 = N/A 1 = High 2 = Moderate 3 = Low or none	0 = N/A 1 = High 2 = Moderate 3 = Low or none	0 - 100%
Hurricane	2	2	2	3	1	2	2	44%
Tornado	2	2	3	3	1	2	2	48%
Severe Thunderstorm	3	1	1	1	1	2	2	44%
Snow Fall	2	1	1	3	1	2	2	37%
Blizzard	0	0	0	0	0	0	0	0%
Ice Storm	3	1	1	3	1	2	2	56%
Earthquake	1	1	2	1	3	2	2	20%
Tidal Wave	0	0	0	0	0	0	0	0%
Temperature Extremes	2	2	0	1	2	2	2	33%
Drought	2	0	0	1	2	2	2	26%
Flood, External	0	0	0	0	0	0	0	0%
Wild Fire	0	0	0	0	0	0	0	0%
Landslide	0	0	0	0	0	0	0	0%
Dam Inundation	0	0	0	0	0	0	0	0%
Volcano	0	0	0	0	0	0	0	0%
Epidemic	2	2	0	3	2	1	1	33%
<b>AVERAGE SCORE</b>	<b>1.19</b>	<b>0.75</b>	<b>0.63</b>	<b>1.19</b>	<b>0.88</b>	<b>1.06</b>	<b>1.06</b>	<b>12%</b>
<i>*Threat increases with percentage.</i>								
<b>RISK = PROBABILITY * SEVERITY</b>								
<b>0.12      0.40      0.31</b>								

# Common Hazards, Associated Risks, and Considerations

# Earthquakes

- No warning
- Significant impact on infrastructure
- Look at environment as resource (be innovative)
- Transportation impacted
- Priorities:
  - Sewer and utility function
  - Safe water
  - Dust (*aspergillus*)

# Floods

- Some warning
- Evaluate roads for history of flooding
- Evacuation plan
- Priorities:
  - Most likely to compromise the quality of available potable water
  - Estimated 48 to 72 hours to get construction materials dry (i.e., wallboard, wood, flooring)
  - Use moisture meter to determine extent of water damage

# Hurricane

- Some warning
- Significant infrastructure damage and disruption
- Hospitals used for shelters (plan accordingly)
- Evaluate supplies of fuel for generators
- Protection of supplies and supply routes
- Possible proactive or reactive evacuations
- Priorities:
  - May involve prolonged power outages
  - Water quality likely to be compromised
  - Sewers likely overwhelmed

# Wildland Fire

- May or may not have warning
- Facilities adjacent to wooded areas should evaluate possibility of wildfire
- Risk to firefighters
- Evacuation may be necessary
  - Resources for receiving/evacuating patients should be evaluated & written into plan
- Priorities:
  - Air quality may be affected by smoke



# Tornado

- May or may not have warning
- Significant infrastructure damage or disruption
- Water supply and sewers intact
- Plan for rapid evaluation of building structure
- Plan for evacuation should be clear
- Priorities
  - Resources for receiving patients documented

# Emerging Infectious Diseases/ Terrorism

- May or may not have warning
- Include biologicals, chemicals, and emerging infectious diseases in planning process
- Key: recognition of suspected cases
- Seek advice from experts
- Consider community resources – NC PHRST, HAZMAT, fire dept, & law officials

# Power Failure

- Loss of primary electrical source
- Possible loss of generators
- Plan for possible evacuation
- Priorities
  - Generators
  - HVAC
  - Sterilizers

## The Functional Hazard- based Emergency Operations Plan (EOP)

# EOP Layout

- Numerous templates available:
  - Emergency Support Function (ESF)
  - State and Local Guide to Emergency Planning (SLG 101)
  - Target Capability Planning
  - Hybrid
  
- Layouts should be able to integrate with other local, regional, state and federal plans
  
- Most adequately address the National Incident Management System (NIMS) and other appropriate regulatory requirements

## Basic Plan

- Purpose and Objectives- outlines the overall purpose and objectives of the plan
  
- Scope- identifies who the plan is applicable to
  
- Authorities- identifies who or what body authorize s the creation and implementation of the plan
  
- Planning Assumptions- provides basic background concerning the planning environment and process

## Basic Plan cont.

- Plan Activation and De-activation- identifies who can activate and deactivate the plan and under what conditions
- Concept of Operations- provides guidance on how the plan should be implemented
- Organizational Responsibilities- identifies responsible individuals and indicates their role in activating implementing and de-activating the plan

## Functional Annexes

- Provides guidance for implementing basic support functions or target capabilities that would be required during a pandemic
- These include resource and utility management, personnel management, security, patient and staff safety, communication, incident management, evacuation, etc.
- Annexes can be activated independently or in coordination with each other based the specific need and conditions

# Other EOP Components

- Job Aids
- Organizational Charts
- Special Response Plans or Response Information (radio frequencies, phone numbers, email addresses, etc.)

## Flexibility

- Disaster are not one size fits so EOP's must be readily adaptable and not rigid
- Plans should be living documents and should be evaluated after every exercise or actual event
- A good EOP should bend but not break!!



# Scalability

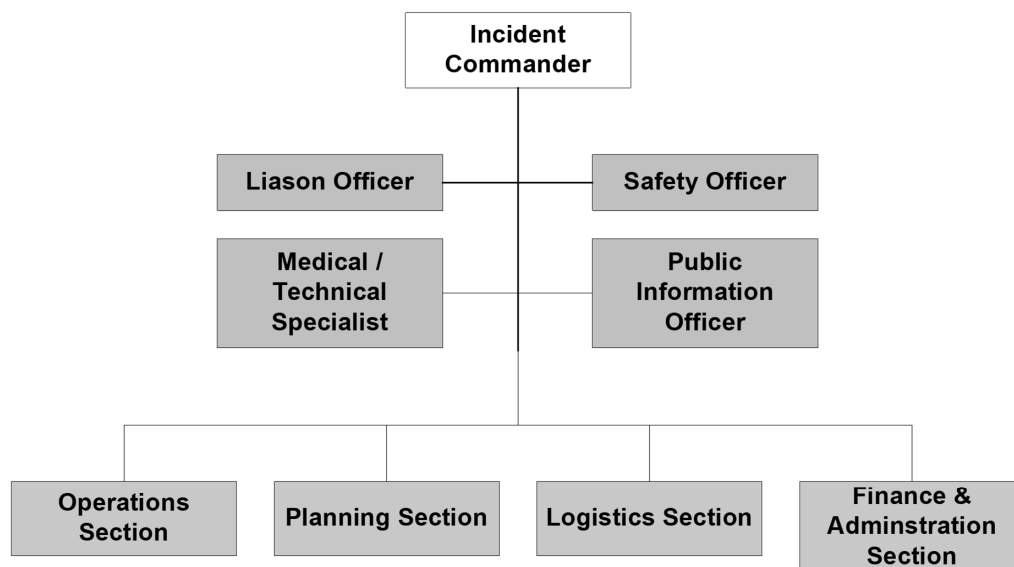
- An EOP should be adaptive for incidents of varying size, duration, and intensity
- Consider a tiered response approach
- Tiers improve the scalability and greatly assists in recovery and demobilization

ICS and NIMS

# Hospital Incident Command System (HICS)

- Incident management system
  - developed to assist medical facilities' operations during emergency situations
- Based on the Incident Command System (ICS)
  - developed by Fire Service as disaster management tool for first responders (e.g., Fire, EMS, Law Enforcement)

## HICS Structure



- Command Staff
- General Staff

# HICS Advantages

- Consistent terminology
- Definitive chain-of-command & communication lines
- Manageable span of control (i.e., scope of supervision)
- Flexible organizational structure that can easily expand and contract

## National Incident Management System (NIMS)

- Provides for a unified approach to incident management
- Focuses on preparedness, mutual aid, resource management, and communication.



# Infection Control Planning Considerations

## Priorities

- Communication
- Surveillance/Communicable Diseases
- Patient Management
- Resource Management
  - Transportation Loss
- Decontamination
- Water/Food Sanitation
- Sewage/Sanitation Management

# Communication

- Know organizations' plan for communication (telephones, radios, foot runners)
- Key personnel decision makers
- Evaluate range of services capacity
- Use information as bait to move people away from key areas such as ER
- Disaster Log
  - Begin ASAP
  - Include: Events, information, decisions made/by whom, problems/actions, needed follow-up, questions

# Surveillance

- Focus on problems related to disaster
- Monitor existing problems
- Surveillance styles adjusted
  - Making rounds
  - Using key people
  - Listening to the grapevine
  - Know what to expect (diarrhea, waterborne illness, foodborne illness)
  - Credible data stops rumor mills

# Communicable Diseases

- Meticulously supervise food & water sanitation
- Maintain reports/communication with LHD
- Evaluate local communicable diseases problems/issues
  - Maintain precautions
- Major outbreaks of infectious diseases rare!

# Patient Management

- Surge capacity
- Rapid triage
  - Alternative triage sites
  - 'Worried well'
- Mass vaccination clinics
- Quarantine
  - Involves multi-disciplinary team
- Alternative care facilities
- Mortality
  - Contact funeral home in advance (capacity & transport)
  - Temporary morgue

# Resource Management

Pre-arrangements with healthcare facilities, vendors

- Staff
- Supplies (PPE, Med Surge, Linen, Scrubs, etc.)
- Medication
  - Vaccines
  - Abx prophylaxis
- May need to ration based upon priority
  - E.g., gloves in ED & plastic baggies other areas
- Consider HLD in place of sterilization

# Transportation Loss

- Pre-determine alternate routes
  - Staff, patients, visitors
  - Supplies
- Temporary locations
  - Storage of supplies
  - Triage

# Decontamination

- Types:
  - Physical
  - Chemical
  - Environmental
- When
- How
- Where

## Water

- For:
  - Hand washing/ necessary bathing
  - Cooking/washing dishes
  - Washing linen
  - Sterilization & processing of scopes
  - Dialysis
  - Hydrotherapy
  - Flushing toilets

# Water

## ● Supply:

- Estimate water needs for facility for 3 days
- Drinking water - **minimum** of 2 liters per day for healthcare workers & patients
- Backup water - 25 gals/day per patient
- State and Federal agencies may provide portable water purification systems & power generators

# Water Sources

## ● Internal Sources:

- Dietary department, Tanks for engineering purposes, Sterile water or IV solution, Spring well on premises

## ● External Sources:

- Local brewers (can water), Local supermarkets (bottled water), Public health department (water tanker), Military (escort water tankers)

# Water

- Purification:
  - Boil for 5-10 minutes
  - Add 10 drops of bleach per gallon
    - Mix thoroughly
    - Allow to stand for 30 minutes before using (can be used for 24 hours)
- Response Phase:
  - Assess tap water immediately (Individual specified in plan)
  - Obtain clearance from public health
  - Communicate findings

# Hand washing

- Waterless alcohol agents (supplies)
  - Storage location
  - Estimate:
    - 4 HW per nurse per h or 32 washes per 8 h shift
    - Each 4 oz (118 mL) bottle of rinse can supply 3 nurse shifts
    - Number of shifts expected in 24 hours
    - Number of nurse shifts per 24 hr is the number of 4 oz bottles needed for 3 days
- Hand washing stations (coffee urn & bucket)
- Towelettes

# Food

- Preparedness Phase:
  - Assess: number of people, emergency power
  - Review order food used with dietary
    - Refrigerated food
    - Food from unpowered freezer
    - Disaster reserve supplies
- Response Phase:
  - Monitor for basic sanitation
  - Monitor holding temperatures
    - Danger zone 45° to 140°F
  - Discard food held in danger zone for 4 hours

# Sewage & Sanitation Management

- Trash pickup disrupted
  - Sanitary storage of solid waste & RME
- Sewage (Preparation)
  - Assess disaster type likely to damage sewer
  - Floods and hurricanes overwhelm them
  - Plan for accessibility to service trucks
  - Define who will assess sewer function in time of disaster
  - Don't flush until assessment done
- Pre-needs contract with chemical toilet supplies



# Sewage

- Intact sewers
  - Bucket of gray water for flushing
    - One good flush in the system
    - Use toilets without flushing
    - Empty or discard bedpans if heavily soiled; may mold a plastic bag inside to form a liner

# Sewage

- Broken sewers: Plan for temporary toilets
  - 3 plastic bags in a bucket
    - Store used bags in a leak proof container
    - Monitor until half full
  - One small bag for one use only
  - Commercial disposable urinals are available
  - Evacuate??

# Advantages of Emergency Operations Planning

## Increased Efficiency

- Eliminates duplicated effort through the responsible management of resources and personnel
- Easier transition from response to recovery to normal operations

# Cost Mitigation

- Plans that promote responsible resource and personnel management are not only more efficient practically, but economically as well
- A well developed plan can help avoid the citations and fines that often follow a major incident

# Team Building

- Brings together personnel with varied background from internal and external to the organization
- Allows for pre-disaster networking
- “During an Emergency is not the time to be exchanging business cards”



# Reputation Management

- Reputation of an organization can be elevated dramatically by mitigating potential hazards through the use of effective planning
- Especially true during large well-publicized disasters or emergencies

## Consequences of not Planning

## Loss of life

- Claims of negligence resulting from gross lack of planning can lead to:
  - Legal issues
  - Monetary losses from settlement
  - Damage to reputation
  - Loss of accreditation and funding sources

## Reputation Damage

- Damage to an organizations reputation from a lack of planning can be very difficult and sometimes impossible to repair
- Loss of accreditation resulting from a lack of planning can further damage the organizations reputation
- A damaged reputation will make it very difficult to recruit quality employees in the future

# Monetary losses

- Failure to plan can lead to monetary losses as a result of:
  - Ruined equipment
  - Legal settlements
  - Increase in workers compensation claims from unsafe and unhealthy practices and conditions
  - Disruption of business
  - Loss of accreditation that results in the suspension of funding sources

## Summary

- Preparation is essential!
  - Appropriate for situation/location
  - Collaborate with local community
- Communicate
- Educate
- Exercise

# Resources

- Disaster Response in APIC Text of Infection Control and Epidemiology
- Healthcare at the Crossroads (The Joint Commission)
- Public Health Issues in Disaster Preparedness: Focus on Bioterrorism (Aspen Publications)
- [www.hazmatforhealthcare.org](http://www.hazmatforhealthcare.org)
- SPICE Bioterrorism I & II, Chemical charts
- 2000 CDC Guidelines for Biological and Chemical Terrorism: Strategies for Preparedness and Response MMWR 2000 Apr 21;49(RR-4)1-14
- Planning Against Biological Terrorism: Lessons from Outbreak Investigations. Emerging Infectious Diseases May 2003; 9(5):515-519.

## Resources Cont.

- State of California Emergency Medical Services Authority  
<http://www.emsa.ca.gov/hics/hics.asp>
- FEMA [www.fema.gov](http://www.fema.gov)
- NIMS Integration Center  
<http://www.fema.gov/emergency/nims/index.shtm>
- Emergency Management: Principles and Practice for Local and State Government
- CDC Emergency Preparedness and Response  
<http://www.bt.cdc.gov/>
- CDC Morbidity and Mortality Weekly Report  
<http://www.cdc.gov/mmwr/>
- National Weather Service [www.nws.noaa.gov](http://www.nws.noaa.gov)

# Resources Cont.

- FEMA Planning Resources- <http://www.fema.gov/emergency/planning.shtm>
- FEMA Emergency Planning Course- <http://training.fema.gov/EMIWeb/IS/is235.asp>
- AHRQ Planning Tools- <http://www.ahrq.gov/prep/#tools>
- CDC Preparation and Planning- <http://emergency.cdc.gov/planning/>
- Lessons Learned Information Sharing System- [www.llis.gov](http://www.llis.gov)

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