Emergency Management Strategies: 
High Volume Patient 
Decontamination

National Emergency Management Summit 
February 2008 - Washington, DC
Session Objectives

• Describe the purpose of patient decontamination at the hospital

• Describe the relationship between a Hazard Vulnerability Analysis (HVA) and the development of decontamination capability

• Explain the design of mass patient decontamination stations
Why Patient Decontamination in the Hospital?

- The Joint Commission (TJC) and OSHA/Dept. of Commerce regulations require hospital Emergency Departments to prepare for hazardous materials incidents including patient decontamination.

- American Institute of Architects (AIA) guidelines 7.9.D.25 indicate that a decontamination area shall be provided.
Hazard Vulnerability Analysis (HVA)

“Hospitals should identify potential hazards, threats, and adverse events, and assess their impact on the care, treatment, and services they must sustain during an emergency”.

“Designed to assist hospitals in gaining a realistic understanding of their vulnerabilities, and to help focus their resources and planning efforts”.

Items to consider

1. Regulatory Requirements
2. Known risks
3. Geographical location
4. Historical incidents
NRC LICENSED NUCLEAR PLANTS

Note: There are no commercial reactors in Alaska or Hawaii.
## Risk – Train Derailment

<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>Incident</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>Scollsbluff, Nebraska</td>
<td>Five rail cars released 66,000 gallons of a flammable liquid</td>
<td>Approximately 3,200 people evacuated for nearly 2 days</td>
</tr>
<tr>
<td>2000</td>
<td>Eunice, Louisiana</td>
<td>A multi-car derailment released various hazardous materials from seven rail cars</td>
<td>2,500 people evacuated</td>
</tr>
<tr>
<td>2000</td>
<td>Sterling Heights, Michigan</td>
<td>Release of hydrochloric acid vapor</td>
<td>Approximately 2,400 people evacuated for about 12 hours</td>
</tr>
<tr>
<td>2000</td>
<td>New Iberia, Louisiana</td>
<td>Train derailment resulting in the release of 600 gallons of xylenes</td>
<td>Eleven-block area was evacuated for 24 hours</td>
</tr>
<tr>
<td>2000</td>
<td>Danville, Kentucky</td>
<td>A boxcar containing sodium dithionite was isolated in a yard</td>
<td>1,000 people evacuated in the surrounding community for 3 hours</td>
</tr>
<tr>
<td>2001</td>
<td>Gadsen, Alabama</td>
<td>Derailment of a tank car containing sodium hydroxide solution released ten gallons of product</td>
<td>Approximately 500 people evacuated</td>
</tr>
<tr>
<td>2001</td>
<td>Gadsen, Alabama</td>
<td>Tank car containing acrylamide derailed secondary to track failure and released 300 gallons of the product</td>
<td>700 people evacuated</td>
</tr>
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</table>

**Table 1**—Rail incidents requiring evacuation (2000–2001)
Methamphetamine Laboratory Seizures - 2004

Sources: El Paso Intelligence Center National Clandestine Laboratory Seizure System; Oklahoma Bureau of Narcotics and Dangerous Drugs Control
Note: States with three seizures or less are not labeled; blank states are zero or not reported

MMWR April 15, 2005 / 54(14);356-359
Minnesota. June 2004

- Two men, aged 31 and 41 years, were manufacturing meth in a camper when a flash fire & explosion occurred.
- Chemicals being used included acetone, propane, and solvents.
- Both men received thermal burns & transported themselves to the hospital without assistance from emergency medical services.

MMWR April 15, 2005 / 54(14);356-359
Risk – Secondary Contamination

New York, November 1996.

• A container with 3 gallons of hydrofluoric acid was improperly disposed of in a dumpster.
• The dumpster was then picked up by a city garbage truck where the contents were compacted.
• Two sanitation employees experienced chemical burns and the employee nearest the release died of hydrofluoric acid inhalation.
• The second employee was transported to the hospital without being decontaminated.

Post-ED arrival stage:
• 2 ED personnel, who were not wearing PPE, sustained respiratory and skin irritation while treating the contaminated employee.
• As a result of the ED injuries, 14 responders and 1 sanitation employee underwent immediate decontamination.

Horton, et al 2003
Risk – Secondary Contamination-2

Washington, April 1996.

An oven exploded as 2 individuals were using acetone, hydrochloric acid, and sodium hydroxide to manufacture methamphetamine in an illicit apartment laboratory.

• The first cooker, who did not undergo decontamination, was able to transport himself to an ED.
• The second cooker’s injuries prevented him from leaving the scene and he was apprehended and decontaminated at the site, and transported to a different ED.
• Additionally, 3 on-site EMTs and 2 police officers exposed to the emissions from the fire sustained eye and respiratory irritation.

Post-ED arrival stage:

• The source of the burns was not revealed by the first cooker and as a result, 3 ED personnel treating the cooker sustained nausea and emesis.
• Thirty personnel and patients of the ED were evacuated for 6 hours.
• None of the injured ED personnel or the other injured first responders were wearing PPE at the time of injury.

Horton, et al 2003
Hazard Vulnerability Analysis (HVA)
How do you score?

Issues to consider for *probability* include, but are not limited to:

- Known risk
- Historical data
- Manufacturer/vendor statistics

Issues to consider for *response* include, but are not limited to:

- Time to marshal an on-scene response
- Scope of response capability
- Historical evaluation of response success

Issues to consider for *human impact* include, but are not limited to:

- Potential for staff death or injury
- Potential for patient death or injury

Kaiser Permanente, 2003
Hazard Vulnerability Analysis (HVA)
How do you score?

Issues to consider for *property impact* include, but are not limited to:

- Cost to replace
- Cost to set up temporary replacement
- Cost to repair
- Time to recover

Issues to consider for *business impact* include, but are not limited to:

- Business interruption
- Employees unable to report to work
- Customers unable to reach facility
- Company in violation of contractual agreements
- Imposition of fines and penalties or legal costs
- Interruption of critical supplies
- Interruption of product distribution
- Reputation and public image
- Financial impact/burden

Kaiser Permanente, 2003
Hazard Vulnerability Analysis (HVA)

How do you score?

Issues to consider for **preparedness** include, but are not limited to:

- Status of current plans
- Frequency of drills
- Training status
- Insurance
- Availability of alternate sources for critical supplies/services
Hazard Vulnerability Analysis (HVA)  
How do you score?

Issues to consider for *internal resources* include, but are not limited to:

- Types of supplies on hand/will they meet need?
- Volume of supplies on hand/will they meet need?
- Staff availability
- Coordination
- Availability of back-up systems
- Internal resources ability to withstand disasters/survivability

Issues to consider for *external resources* include, but are not limited to:

- Types of agreements with community agencies/drills?
- Coordination with local and state agencies
- Coordination with proximal health care facilities
- Coordination with treatment specific facilities
- Community resources

Kaiser Permanente, 2003
Case Study

2007 Tier II reporting
- EPA has designated 440 extremely hazardous chemicals of which 138 facilities in Dane Co. have them present above the threshold planning quantities according to Dane Co. Emergency Mgmt
- 435 facilities reporting 1,467 different chemicals in quantities over 10,000-pounds

Historical
- 40+ users of the decontamination service over the past 5 years
- Most common patient decontamination is from industrial accidents
Case Study

Other variables:

- Literature indicates that 90% of all contaminated victims are ambulatory.

- During the Tokyo subway incident, 640 patients self presented to Emergency Departments within the first 1 ½ hours.

- Major trauma centers and hospitals designated by the Local Emergency Planning Committees (LEPC) for care of chemically contaminated patients should have a higher level of preparedness.

- Agreements with NDMS

- Agreements with Nuclear plants in WI for emergency patient response and decontamination.
Patient Decontamination Facility & Capacity

OLD System:
• Approx. 144 sq. ft.
• Capacity of six (6) patients/hour
• (1) ambulatory & (1) liter borne patient per 15 minutes.
Level B Supply Air Equipment
University of WI Hospital & Clinics
Hazards Vulnerability Analysis (HVA)
Mass Casualty Hazmat Incident

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<th>EVENT</th>
<th>PROBABILITY</th>
<th>SEVERITY = (MAGNITUDE - MITIGATION)</th>
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<td>SCORE</td>
<td>0 = N/A</td>
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Mass Casualty Hazmat Incident (From historic events at your MC with >= 5 victims) BEFORE

|     | 3 | 3 | 3 | 3 | 3 | 3 | 2 |

*Threat increases with percentage.

RISK = PROBABILITY * SEVERITY

*Likelihood this will occur: 0 = N/A, 1 = Low, 2 = Moderate, 3 = High
Possibility of death or injury: 0 = N/A, 1 = Low, 2 = Moderate, 3 = High
Physical losses and damages: 0 = N/A, 1 = Low, 2 = Moderate, 3 = High
Interruption of services: 0 = N/A, 1 = High, 2 = Moderate, 3 = Low or none
Preplanning: 0 = N/A, 1 = Low, 2 = Moderate, 3 = High
Time, effectivenes, resources: 0 = N/A, 1 = Low, 2 = Moderate, 3 = Low or none
Community/ Mutual Aid staff and supplies: 0 = N/A, 1 = Low, 2 = Moderate, 3 = Low or none

Score: 0 - 100%
NFPA 1600 – 2007 Edition

5.5 Mitigation

5.5.1 Develop & Implement a strategy to limit or control the consequences, extent, or severity of an unpreventable incident

5.5.2 Strategy should be based on hazard identification and risk assessment, impact analysis, program constraints, operational experience, and cost-benefit analysis

5.5.3 Strategy shall include interim and long term actions to reduce vulnerability

National Fire Protection Association, 2007, p. 1600-6
Mitigation activities

“Those activities a hospital undertakes in attempting to lessen the severity and impact of a potential emergency”.

Preparedness activities

“Those activities a hospital undertakes to build capacity and identify resources that may be used if an emergency occurs”.

Mitigation & Preparedness - UWHC

*Chemical Spill in the Community* - It’s going to happen!

*HVA Relative Threat: 94%*

**Goal: Lower Severity Scores by:**

1. Upgrading Patient Decontamination Facilities & Capacity decreasing the *Human Impact* Score

2. Selecting and using appropriate HVAC, plumbing, and electrical systems to reduce the *Property & Business Impact* Scores
Decontamination Suite

WE NEED TO MAINTAIN COMPLETE CONTAINMENT!

ABSOLUTELY!

ATTENTION EMS PERSONNEL
IF YOU SUSPECT THAT YOUR PATIENT HAS BEEN CONTAMINATED WITH A BIOLOGICAL OR CHEMICAL SUBSTANCE
DO NOT ENTER THE EMERGENCY ROOM WITHOUT PRIOR NOTIFICATION
THANK YOU
Build Efficiency

1. Process must be easy to use in the middle of the night when the ED is extremely busy!

2. Room lights have been added to an occupancy sensor and are connected to the high velocity discharge fan.

3. Collection tank monitor mounted inside decon suite
Six Critical Areas of Emergency Response

- Communication (EC.4.13)
- Resources and assets (EC.4.14)
- Safety and security (EC.4.15)
- Staff responsibilities (EC.4.16)
- Utilities management (EC.4.17)
- Patient clinical and support activities (EC.4.18)

The Joint Commission (2007)
Selecting the PPE

Just my size!
Facility Floor Plan
Ambulance Garage – Decontamination Entrance

Supplied Air Connections for Triage Team

Card Access
Build Efficiency

Maximize automation to reduce needed staff resources and increase efficiency

• Program showers on timer
• Preset water temperature @ 104°F
• Affix soap and signage at each shower

Ahhh, this water is warm!

Is this soap tear-free?
Undress completely. Place all clothing/shoes in the red lined plastic bin. Put all valuables in the white patient bag and lock in a locker.

Desvístase completamente. Coloque toda la ropa/los zapatos en el cubo forrado con plástico rojo. Coloque todas las cosas de valor en la bolsa blanca de pertenencias del paciente y métala en un armario con llave.
25 ft air hoses

Grated flooring
Roller table secured to flooring
Holding Tank – 10,000 gallon
Approx. 9 hr fill time
Holding Tank Design Features

- Pump-out Spill Container
- Pump-out Opening
- 12" x 24" Cast Iron Traffic Rated (HS-20) Access Cover and Frame
- Ball Float Valve
- Waste Piping
- Single Wall Fiberglass Tank 10,000 Gallon Capacity
- Sand
- 4" AWWA Water Service Valve
- Controlled Outlet
- Post Indicator Valve, Crane #520, NBCC NP-1 or A/E Approved Equal
- 36" O.D. Steel Traffic Rated (HS-20) Frame & Lid
- Access Way
- Gauge Opening
-Provide Containment Bell
- Concrete Pad over Tank.
Exercising the process

Yikes!
This board is hard.

This is the best shower I’ve had in the past 2 weeks!
# University of WI Hospital & Clinics
## Hazards Vulnerability Analysis
### Mass Casualty Hazmat Incident

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**RISK = PROBABILITY * SEVERITY**
Funding Resources

1. Madison was a recipient of the Domestic Preparedness exercise series provided under the authority and funding of the Nunn-Lugar-Domenici Domestic Preparedness program for 120 US cities at increased risk for NBC attach.

2. Madison is also one of the US cities currently part of the Metropolitan Medical Response System.

3. Federal grant money through Health Research and Services Administration (HRSA)

4. State and Local Emergency Management regulation allows organizations to bill the spiller
“Plans are nothing…planning is everything”

Dwight D. Eisenhower
References & Resources


Questions?

Tracy L. Buchman, DHA
Candidate
Safety Director, UW Hospital & Clinics
Madison, WI
tbuchman@uwhealth.org