

# SE Minnesota Healthcare Coalition

*Enhancing Regional Preparedness, Response and Recovery*

# Hospital Patient Decontamination Capability Guidelines

April 2013

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## INTRODUCTION

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The Healthcare Coalition consists of organizations with responsibilities to mitigate the likelihood of a hazard negatively impacting the ability of a healthcare system to provide services and to prepare for, respond to, recover from consequences of a disaster to the healthcare system, the purpose of the SE MN Healthcare Coalition is to facilitate preparedness to assist communities with building a Health and Medical Services (Emergency Support Function 8/ESF8) Capability to respond to and recover from disasters.

The following groups are represented as part of the SE Healthcare Coalition:

- Hospitals
- Local Public Health
- Emergency Management
- Emergency Medical Services Regulatory Board (EMSRB)
- South East Emergency Medical Services (SE EMS)
- Long Term Care Facilities
- Specialty Services such as(e.g. dialysis centers, hospice centers, American Red Cross)

**This document provides a foundation for hospitals to determine appropriate contaminated patient decontamination capabilities.**

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## HAZARD BACKGROUND

### GENERAL BACKGROUND

While natural hazards pose the greatest risk to communities, historically, hazardous chemical spills continue to be a threat in the United States. From 2004-2009, nearly 15,000 hazardous materials incident occurred nationwide.<sup>i</sup> Specific community information can be obtained in states that had participated in the Hazard Substances Emergency Events Surveillance (HSEES) system (<http://www.atsdr.cdc.gov/hs/hsees/>).

For example, the **top hazardous substance** released in **Olmsted County** and bordering counties from 2000-2009 was **anhydrous ammonia**, except for **Fillmore County** where the top substance was **ethanol**. (personal communication, Nancy Rice, Minnesota Department of Health, October 2010) Top hazards for the remaining SEMN counties include:

- Goodhue – anhydrous ammonia
- Houston – no reportable releases
- Freeborn – anhydrous ammonia
- Steele – Paints and Coatings
- Rice – Volatile Organic Chemicals

Recent area incidents demonstrate that hazardous chemical spills are a hazard that should be considered by the community and hospitals for emergency planning, training and exercise activities. Recent events include:

- **8/6/10 – Alleged Chlorine (Valley Fair); 26 to Hospitals**
- **10/5/10 – Sodium Bisulfate (St. Paul); 3 to Hospitals**
- **10/26/10 – Sulfuric Acid (Owatonna); 3 to Hospitals**
- **12/10/10 – Anhydrous Ammonia (Randolph); 55 to Hospitals**

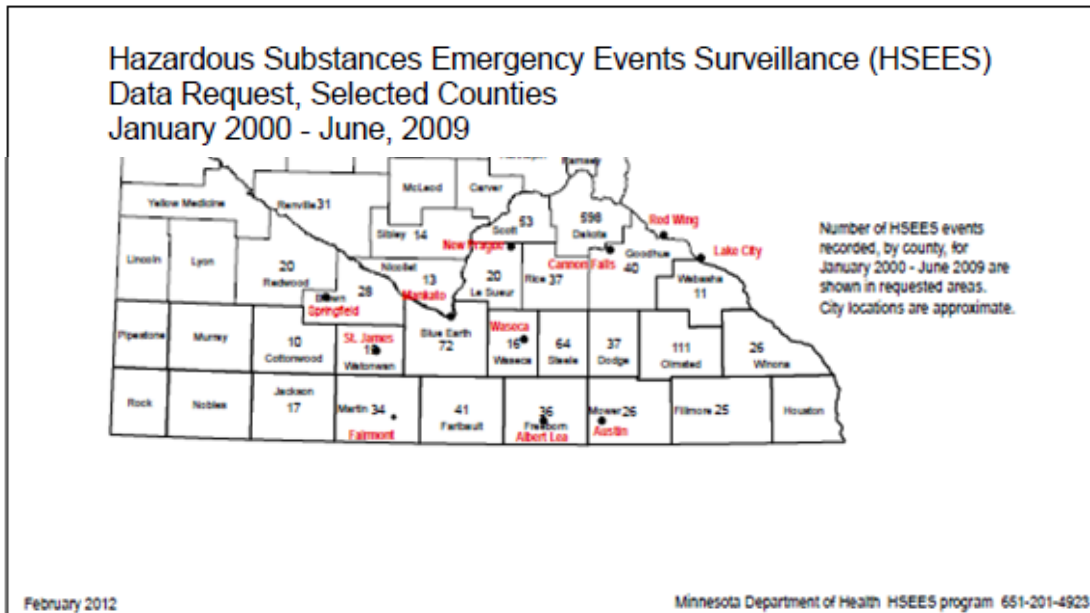


Figure 1. HSEES Data for 25 Southern MN Counties

## LIKELIHOOD OF CHEMICAL INCIDENTS RESULTING IN CONTAMINATED PATIENTS PRESENTING TO THE EMERGENCY DEPARTMENT

While chemical release incidents are not uncommon, incidents that result in contaminated patients presenting to the hospital Emergency Department are a small fraction of reported events<sup>ii</sup> and cause few serious toxic exposures per event.<sup>iii</sup> Yet, data indicates that hospitals cannot rely on public safety agencies to control and decontaminate victims on scene; **over 80% of victims from the chemical release site self-refer to the hospital outside of the pre-hospital system.**<sup>iv</sup>

Additionally, a number of self-referred patients may arrive prior to the Emergency Department receiving formal notification of an event from public safety agencies. In the Tokyo Sarin release incident, the first walk-in victim arrived within 33 minutes from the onset of the event; the first patient transported via ambulance arrived 15 minutes after the first walk-in patient.<sup>v</sup>

Chemical incidents that occur outside of the hospital tend to be limited in size with very few casualties, **often only one.**<sup>vi</sup> (personal communication, Nancy Rice, Minnesota Department of Health, October 2010) Chemical incidents that involve large numbers of exposed/contaminated victims are rare; between 1975 and 1999, worldwide there were **only 25 incidents that resulted in over 25 deaths and 100 injuries.**<sup>vii</sup> Events that cause such large-scale casualties result from gas/vapor exposure to chemicals.

From 2004-2009, 14,822 incidents nationwide involving hazardous materials resulted in **an average of 1.58 patients that required decontamination.** (The maximum number of patients requiring decontamination was 48.)<sup>viii</sup> Local information, according to the Minnesota Department of Health, for hazmat incidents between 2002-2009 in Olmsted County and bordering counties, three victims received decontamination on scene and **zero received decontamination at a medical facility** (and nine not reported/unknown). The agents involved in the incidents that required victim decontamination were ethanol, nitrogen fertilizer and sulfuric acid. (personal communication, Nancy Rice, Minnesota Department of Health, October 2010) Table 1 indicates the location and number of victims decontaminated for incidents across 25 southern Minnesota counties from 2002 to 2009. This local data further supports other HSEES data that incidents involving decontamination at hospitals for higher risk hazardous substances are minimal.

Decontamination Location	# Victims Decontaminated
None	179
On Scene	16
Medical Facility	20
On Scene & Medical Facility	4
Not Reported/Unknown	6

Table 1. Victim Decontamination for 25 Souther MN Counties, 2002-2009

Considering chemicals of primary concern (Priority 1) on the Terrorism Listing of the Centers for Disease Control and Prevention, Ruckart and Fay (2006) provide the following useful data:

- Although **Priority 1 chemicals represent only 2.0% of reported chemicals**, events involving Priority 1 chemicals, especially ammonia, acids, and volatile organic compounds, **accounted for 20% of the releases.**

- Although Priority 1 chemicals represent only 2.0% of reported chemicals, events involving Priority 1 chemicals **resulted in twice as many incidents involving victims**, primarily from acids, ammonia, and chlorine.
- **Decontamination was performed at medical facilities during 1% of Priority 1 events** for:
  - 711 employees (of chemical sites)
  - 622 responders
  - 674 members of the general public<sup>x</sup>

Minnesota 2008 HSEES data provides additional information about the timing for higher risk of incidents occurring and therefore when patients could present to an Emergency Department.

- The highest number of incidents occurred in July (12.5%).
- **Nearly 85% of incidents occurred during the weekday.**
- **Over 70% of events occurred between 6:00 AM and 5:59 PM;** 16.2% occurred from 6:00 PM to 11:59 PM and 12.2% occurred from 12:00 AM to 5:59 AM.
- 58.2% incidents involved one victim; 16.4% involved two victims; 25.5% involved three or more victims – of the 14 incidents, five events involved more than ten victims.
  - Of the five events, three involved anhydrous ammonia releases, one involved a release of potassium hydroxide and ammonia, and one involved a release of carbon monoxide.
- 80% of victims were not decontaminated; 6.7% were decontaminated on scene; **10% (18) were decontaminated at a medical facility, 3.3% (6) were decontaminated both on scene and at a medical facility.**
- **The median number of uninjured decontaminated individuals was two persons per event (range: 1-6).<sup>x</sup>**

## LIKELIHOOD OF SECONDARY CONTAMINATION OF EMERGENCY DEPARTMENTS AND PERSONNEL

Data from the Hazardous Substances Emergency Event Surveillance (HSEES) system does not indicate secondary contamination of hospital Emergency Departments or personnel is a common occurrence;<sup>xi</sup> however, limitations to the data include lack of awareness of the HSEES system by hospital staff, and limited participation of states in the HSEES program.

Although not common, Clarke et al. (2008) cited a number of articles that indicated secondary contamination of healthcare facilities and personnel had occurred, even with just a single contaminated patient.<sup>xii</sup> While patients exposed to gas or vapor that have undergone pre-hospital decontamination at/near the incident scene were not likely to pose a secondary contamination risk to Emergency Department personnel, Burgess (1999) also recognized that patients grossly contaminated with liquid vapor or solid hazardous substances posed a risk to Emergency Department personnel.<sup>xiii</sup> Between 1995 and 2001, **0.4% of industrial chemical incidents resulted in secondary contamination of healthcare personnel.**<sup>xiv</sup> The health outcomes related to contamination is unknown.

As a result of the 1995 Sarin attack in Tokyo, 5,510 patients presented to area hospitals. The vast majority of patients posed no secondary contamination threat to hospital staff. Out of the total number of patients that arrived at hospitals, 17 were critically ill, 37 were severely ill, 984 were moderately ill; 54 required mechanical ventilation.<sup>xv</sup> **For ambulatory patients that arrived on their own, especially those exposed to gas or vapor substances or those that had been decontaminated at/near the incident scene, the risk of secondary exposure to staff was**

**relatively low.**<sup>xvi</sup> While the tremendous number of victims overwhelmed the primary hospital's Emergency Department, the low incidence rate of secondary exposure supports the conclusion that low acuity patients from a chemical exposure pose low risk to Emergency Department personnel.<sup>xvii</sup>

As a hospitals surrounded by a large rural/agriculture region, decontamination planners may gain insights from Berkowitz, Horton, and Kaye's (2004) article that explored the differences of hazardous substance releases causing fatalities and/or people transported to hospitals in rural/agricultural areas versus other areas. They found:

- The most frequently released chemicals in rural/agricultural areas were ammonia, chlorine, and pesticides.
- Decontamination was administered in 48% of the events.
- Most decontamination occurred at the scene.
- Most victims were attributed to ammonia releases.
- Zero hospital employees were injured as a result of secondary exposure to chemicals in the "rural/agriculture" category.
- Seven hospital employees were injured as a result of secondary exposure to chemicals in the "all other areas" category.
- Of admissions to hospitals, the majority sustained respiratory tract symptoms that were often accompanied by gastrointestinal symptoms, eye irritation, headache, shortness of breath or other symptoms.<sup>xviii</sup>

Phelps offered the following for emergency services personnel to consider during a hazardous materials event:

- "5 out of 6 are not contaminated, they just think they are
- If they are walking and talking, they probably can't kill me
- The dangerous patients are the non-ambulatory ones"<sup>xix</sup>

## **CONSEQUENCES OF SECONDARY CONTAMINATION TO EMERGENCY DEPARTMENTS AND PERSONNEL**

"Secondary contamination [to Emergency Department staff from contaminated patients] can cause adverse symptoms and injuries in ED personnel, further contaminate the ED, and potentially lead to costly ED closures and evacuations."<sup>xx</sup>

Multiple episodes of provider illness from off-gassing patients have occurred. Typically, the exposure is from patients who ingest organophosphate contaminants. The chemical is then present in the patient's secretions, vomitus, and the chemical exudes from the skin for days, which produces an off-gassing hazard for healthcare workers.<sup>xxi</sup>

Ingestions accounted for more severe injuries to providers than what occurred during the Tokyo Sarin event in 1995. **No provider in Tokyo was incapacitated by symptoms.**<sup>xxii</sup> Off-gassing events that affected providers generally involved acid gases and pesticides.<sup>xxiii</sup> **Clothing control was almost never performed in these cases.**

A study by Schultz, Cisek and Wabeke (1995) using a mannequin soaked with acetone or p-Xylene, which is a good model for organophosphates because of similar physical characteristics, indicated that concentrations, if extrapolated to Sarin, would fall within the protective capability of a

**3M Breathe Easy 10 PAPR (the kind typically used by hospital-based decon team members); however, without protection levels would have been rapidly lethal.**<sup>xxiv, xxv</sup>

According to Hick, “there is no question that the nerve and **organophosphates** are the key agents that pose a significant contact and off-gassing **risk to providers**. Historically, these agents **have caused the most significant injuries**.”<sup>xxvi</sup>

Consideration of what have been the worst reported emergency department personnel injuries related to secondary contamination supports Hick’s statement. In one case, one nurse required intubation and required antidote therapy after contact and vapor exposure to a patient that ingested organophosphate (OPP) pesticide; the patient had ingested organophosphates in a suicide attempt. The nurse was exposed to chemical in secretions and from off gassing.<sup>xxvii</sup>

In another case, two physicians required antidotes after exposed to Sarin severely poisoned patients in Tokyo; they did not have to stop providing patient care.<sup>xxviii</sup> Staff that exhibited symptoms related to secondary exposure were providing care in areas with poor ventilation – the ICU and a makeshift care area in the chapel. The incidence of secondary exposure in the Emergency Department was relatively low.<sup>xxix</sup>

Local HSEES data (Table 2) indicates no hospital employees were injured as a result of chemical releases that occurred in 25 southern Minnesota counties from 2002 to 2009.

Category	# of Victims
Employee	104
General Public	53
Student	51
Firefighter	14
Responder (Not Specified)	6
Emergency Medical Technician	3
Police Officer	2
Category Not Available	1

*Table 2. Victim Categories and Quantity from Incidents Occurring across 25 southern Minnesota counties, 2002-2009*

## DECON PROGRAM PERFORMANCE METRICS

Defining performance capabilities allows hospitals to define whether or not adequate preparedness has occurred. **While performance measure may vary between hospitals, based on risk assessments, the following performance measures and target metrics should be considered.**

### Operations-Based Decon Program Performance Measures & Target Metrics

Performance Measure	Threshold
Percentage of patients presenting to the hospital with signs and symptoms of hazardous materials exposure are identified prior to entry into the Emergency Department.	<b>100%</b>



Performance Measure	Threshold
Time to first patient beginning self decon.	< 5 Min.
Time to first ambulatory patient beginning wet decon.	< 10 Min.
Time to first non-ambulatory patient beginning wet decon.	< 20 Min.
Percentage of patients meeting decon criteria are decontaminated to a level that poses no further risk to the patient or others.	100%
Average Patient (Role-Player) Human Factor Assessment response rate. (Exercises Only)	=/> 4.0
Number of patients injured during the decon process.	0
Number of employees injured during decon operations.	0
Percentage of patients that are provided privacy.	100 %

## DECON PROCESS CONSIDERATIONS

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### PATIENT ARRIVES AT ED

**ED triage staff would benefit from clear criteria for determining which patients do not require decontamination, which require clothing control only, or which require spot or full wet decontamination.** Conducting a hazard assessment to separate vapor from liquid hazards, in order to drive appropriate response actions, may provide a basis for establishing this criteria. **Phelps describes the Israeli decon model in simple terms that could provide a basis for establishing criteria:**

- If symptomatic of hazardous substance exposure at hospital = shower
- If not symptomatic of hazardous substance exposure at hospital = no shower<sup>xxx</sup>

Arnold also provides guidance that should be considered when developing criteria, **“Previously decontaminated patients and patients exposed only to gas or vapor who have no evidence of skin or eye irritation may be transferred immediately to the critical care area.”**<sup>xxxii</sup>

### PATIENT DIRECTED TO DECON AREA/PATIENT IS DECONTAMINATED (SELF DECON)

Victims of an incident involving hazardous materials incident can be exposed to agents via one or more of three routes: skin (liquid and high vapor concentrations), eyes (liquid or vapor), and respiratory tract (vapor inhalation).<sup>xxxii</sup> **Airborne releases involving gases or vapors are the most common type of hazardous substance release;**<sup>xxxiii</sup> **therefore, most incidents would pose little secondary contamination risk to hospital Emergency Department personnel.** Arnold indicated that:

“Victims who [are] exposed only to gas or vapor and have no gross deposition of the material on their clothing or skin are not likely to carry significant amounts of chemical beyond the hot zone and are not likely to pose risks of secondary contamination to hospital personnel.”<sup>xxxiv</sup>

Lake, Fedele, and Marshall (2000), in a Soldiers and Biological Chemical Command (SBCCOM) report, support Arnold’s statement and indicate that **while a victim that is grossly contaminated**

with a liquid hazardous substance should be decontaminated with copious amounts of water, clothing control would be adequate decontamination for gas and vapor exposures.<sup>xxxv</sup>

Still, establishing an effective dry self-decon procedure that involves “disrobing” could pose a challenge to hospitals, especially given the multicultural population of many communities and the patient mix received at the Emergency Department. Real world incidents (i.e., Tokyo Sarin event), real world events that involved hoaxes (i.e., Washington DC “anthrax” event and Lansing, MI “white powder” events), and other exercises demonstrate the challenges with a patient disrobing procedure. In 25 of 70 exercises, experienced urban firefighters failed to get victims to disrobe prior to gross decontamination.<sup>xxxvi</sup>

Levitin, et al. (2003) suggest that clear care procedures must be developed for the following groups:

- The Dead (not transported to the hospital; no secondary exposure risk)
- The Non-Ambulatory Injured (small percentage of survivors; moderate/high secondary exposure risk if not decontaminated on scene)
- The Ambulatory Injured and Ambulatory Worried Well/Non-Injured (80-90% of survivors; no/low secondary exposure risk)<sup>xxxvii</sup>

**The presented data suggests developing dry self-decon procedures will minimize most secondary exposure risk to hospital facilities and personnel during a hazardous materials incident that results in mass casualties. As such, a large shower facility is not be required to effectively meet patient care needs without creating additional safety risks to staff and other occupants; however, an area to provide privacy for mass dry decontamination (i.e., disrobing and clothing containment) will be needed.**

## **PATIENT IS DECONTAMINATED (ASSISTED DECON)**

Hazardous materials incidents may create a situation where demand for services (patients) overwhelm supply (decontamination) capabilities. As such, patient prioritization (triage) for decontamination would have been appropriate. In order to determine which patients should have received decontamination first, following the principle of the greatest good for the greatest number of patients. For employee safety, patient triage in the dirty zone should only be conducted by those wearing appropriate personal protective equipment.

A number of articles and reports offer guidance for triage during hazardous materials incidents with mass casualties. Jagminas indicates the chemical warfare casualties should be separated into three groups:

- those who require immediate intervention for survival (first priority for decon)
- those who have injuries that place them in no immediate danger of loss of life (secondary priority for decon), and
- those for whom the degree of medical care required exceeds that which is available (last priority for decon).<sup>xxxviii</sup>

In *Guidelines for Mass Casualty Decontamination*, the authors provide the following factors that determine the highest priority for on scene ambulatory victim decontamination:

- “Casualties closest to the point of release,

- Casualties reporting exposure to vapor or aerosol,
- Casualties with evidence of liquid deposition on clothing or skin,
- Casualties with serious medical symptoms (shortness of breath, chest tightness, etc), and
- Casualties with conventional injuries.<sup>”xxxix</sup>

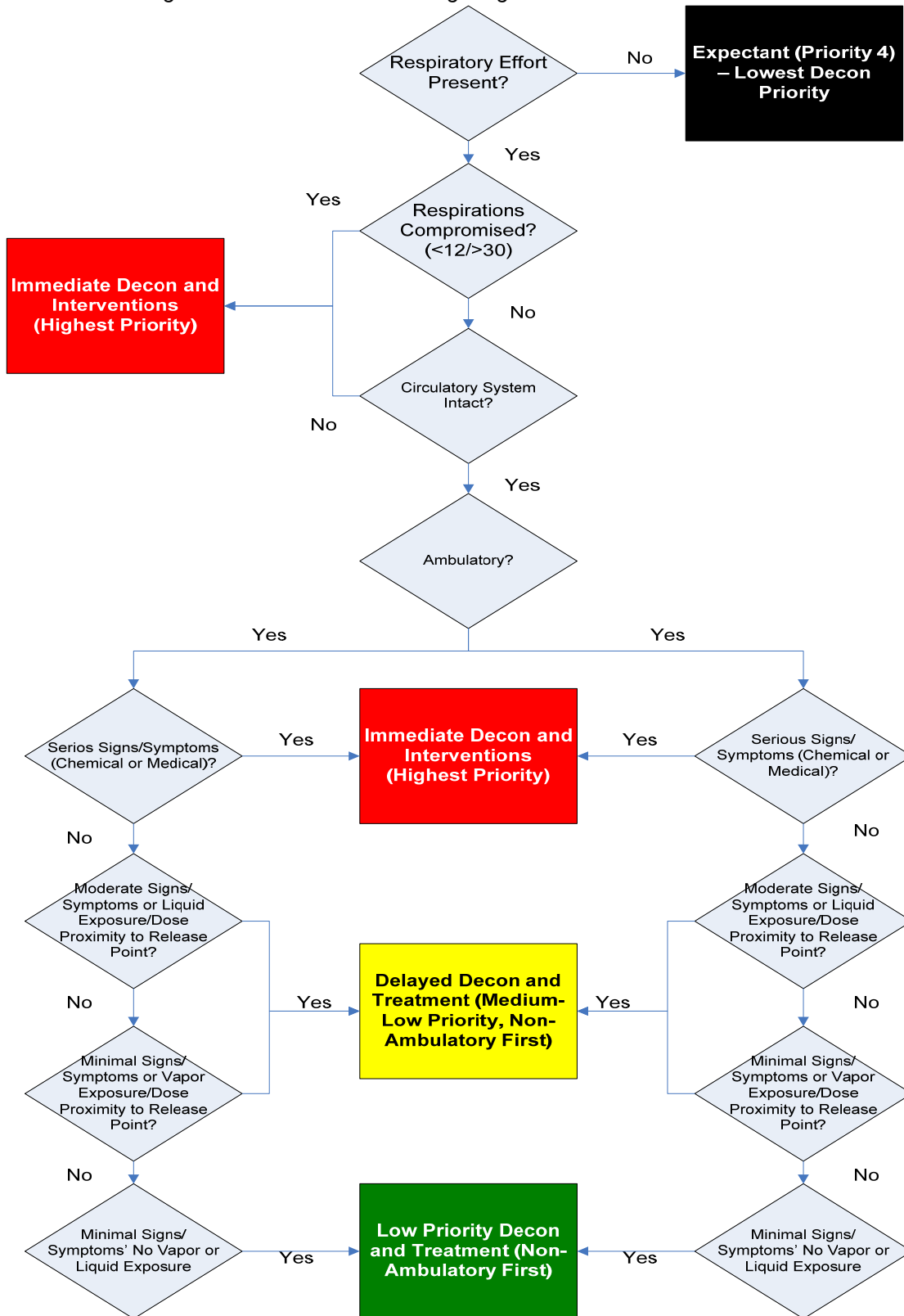
*Guidelines for Mass Casualty Decontamination* provides a modified START algorithm (Figure 1) for use during an incident that involves chemically contaminated patients.<sup>xi</sup>

The initial patients arriving to Emergency Department, and the majority of patients overall during a large scale incident, will likely be ambulatory and quite capable of performing self-decontamination tasks to quickly reduce or eliminate continued exposure from skin contaminants. **Hospitals should minimize decontamination delays by establishing processes for patient “dry” (clothing control) self-decontamination procedures without the need for staff assistance. A decontamination room should be set up in an intuitive way that would allow ambulatory patients to perform “wet” self-decon. Implementing a Lean 5S system and visual management would help create a self-decontamination capability.**

Any delay with initiating patient decontamination can result in increased negative patient experience and outcomes. **Current decontamination processes in hospitals across the nation have an inherent delay between arrival of a contaminated patient and initiation of decontamination.**

Recognizing **ambulatory patients pose a low risk of secondary contamination to the hospital and Emergency Department personnel, which is reduced further through disrobing and clothing control**, the performance-level model of hospital decontamination described by Phelps and Doering (2008) addresses the inherent delay within a hospital’s decontamination processes. **Implementing the model successfully would allow for immediate patient care for ambulatory patients<sup>xli</sup>** and would provide a process that achieves a number of Decontamination Program Performance Standards listed previously.

Figure 2. Modified START Triage Algorithm For HazMat Incidents



The table below is an adaptation of Phelps and Doering's (2008) model that should be considered as a model for hospitals to achieve desired performance outcomes. **All hospitals should have the capability to conduct decontamination actions one through four with the exception of activating a second team indicated in action four. Additional capability will be dependent upon the risks associated with a given community.**

Action #	Time from Recognition	Decon Staffing	Response Actions	Patients	Cleanliness
1	0 0  <1 Minute	NA	Upon Recognition, take Awareness Level Actions 1. Safety – Do not touch contaminated patients. 2. Isolate – Move the patient away from others to prevent secondary exposure; control and clean any contaminated areas of the facility; implement hospital/ED access control 3. Notify – Activate decontamination team; notify Emergency Department staff and other frontline staff in the ED area of the hazardous materials incident; activate mass casualty protocols as appropriate.	NA	NA
2	<5 Minutes	One at a safe distance, not in PPE	Patient - Strip & Shower 1. Strip - Patient directed to perform “dry” decon by disrobing and controlling clothing. 2. Shower - Patient directed to perform unassisted self “wet” decon.  Decon Team <sup>1</sup> 1. Report to team staging area for situation brief and PPE donning.	Ambulatory	1. 75-90% 2. 100%
3	<10 Minutes	1	One decon team member conducts rapid donning and enters dirty zone to assist “wet” decon operations.	Ambulatory	100%
4	<20 Minutes	10	Decon Team <sup>1</sup> 1. Continue directed “dry” self decon activities and initiate mass triage and assisted decontamination activities.  Decon Team (Second Team) <sup>2</sup> 1. Report to team staging area for situation brief and PPE donning.	Ambulatory & Non-Ambulatory	100%
5	40 – 50 Minutes	6 New	Decon Team (Second Team) <sup>2</sup> 1. New members rotate into dirty zone to continue directed	Ambulatory & Non-	100%

Action #	Time from Recognition	Decon Staffing	Response Actions	Patients	Cleanliness
			<p>“dry” self decon, triage, and assisted decontamination activities; clean zone staff remain the same.</p> <p>Decon Team (Third Team)<sup>2</sup></p> <p>1. Report to team staging area for situation brief, pre-operational medical surveillance and PPE donning.</p>	Ambulatory	
6	60-80 Minutes	6 New	<p>Decon Team (Third Team)<sup>2</sup></p> <p>1. New members rotate into dirty zone to continue directed “dry” self decon, triage and assisted decontamination activities; clean zone staff remain the same.</p>	Ambulatory & Non-Ambulatory	100%

<sup>1</sup> Decon Team Leader (clean zone), Decon Safety Officer (clean zone), Decon Triage Officer (dirty zone), Strip Supervisor (dirty zone, but may be able to direct disrobing activities from a safe distance), Washers (x4 – dirty zone; one to assist and facilitate movement of ambulatory patients, three to decontamination non-ambulatory patient), and Standby “Rescue” Decon Team member (x2 – clean zone, initially act as attendants to support Decon Safety Officer with facilitating donning of PPE for other decon team members, then partially dressed out in PPE). Decon team members in the dirty zone would require some level of PPE. **Note: Hospitals planning to address only one non-ambulatory patient need only three decon team members at a minimum, ideally four.**

<sup>2</sup> Decon team members to replace team members in the dirty zone: Standby “Rescue” Team members become washers, two additional washers needed, Decon Triage Officer, Strip Supervisor, and Rescue Decon Team members (x2).

## TRAINING

**“ED workers should be aware that a substance poses a risk for secondary contamination if it is toxic and likely to be carried on the victim’s clothing, skin, or hair in sufficient quantities to threaten rescuers or health care providers.”**<sup>xiii</sup> Even so, recognizing that a patient is contaminated with a hazardous substance can be challenging.

Indicators of a chemical incident are included in the typical hospital Hazardous Materials Awareness Level training programs. OSHA requires that “individuals who are likely to witness or discover a hazardous substance release” complete Awareness Level training.<sup>xiii</sup> The OSHA Best Practices for Hospital-Based First Receivers from Mass Casualty Incidents Involving the Release of Hazardous Substances provides specific guidance about who should be trained to the Hazardous Materials Awareness Level:

“First Responder Awareness Level training is required for those employees who work in the contaminant-free Hospital Post-decontamination Zone, but might be in a position to identify a contaminated victim who arrived unannounced. This group includes ED clinicians, ED clerks, and ED triage staff who would be responsible for notifying hospital authorities of the arrival, but would not reasonably be anticipated to have contact with the contaminated victims, their belongings, equipment, or waste. The group also includes decontamination system set-up crew members and patient tracking clerks, if their roles do not put them in contact with contaminated victims, their belongings, equipment, or waste (e.g., setting up the decontamination system before victims arrive, or tracking patients from a location outside of the decontamination zone).

First Responder Awareness Level training also is required for hospital security guards who work away from the Hospital Decontamination Zone, but who may be involved tangentially in a mass casualty event (specifically, those security personnel who would not reasonably be anticipated to come in contact with contaminated victims, their belongings, equipment, or waste) (OSHA 1991b). Security staff assigned to roles in the Hospital Decontamination Zone would require a higher level of training (e.g., First Responder Operations Level).<sup>xiv</sup>

With the likely presentation of patient to the Emergency Department prior to notification of an event, **recognition and control of a contaminated patient at arrival to the Emergency Department is critical to minimizing secondary contamination to the facility and personnel.** Yet, guidance in a United Kingdom DHSS Health Building Note 22 for Accident and Emergency Departments (1986) has not been implemented proactively into facility designs in the United States to minimize secondary contamination. Guidance in the note states, “this [decon] room should be near the entrance to the [Emergency Department]...”

Establishing and controlling a “dirty/warm” zone and a “clean/cold” zone is a recognized challenge for most agencies responding to a hazardous materials event. Phelps (2006) reported that, in a series of 70 large-scale exercises as part of the Office of Domestic Preparedness (ODP), Chemical Weapons Improved Response Program (CWIRP):

- 50% of responders did not establish clearly defined zones (15% unreported)

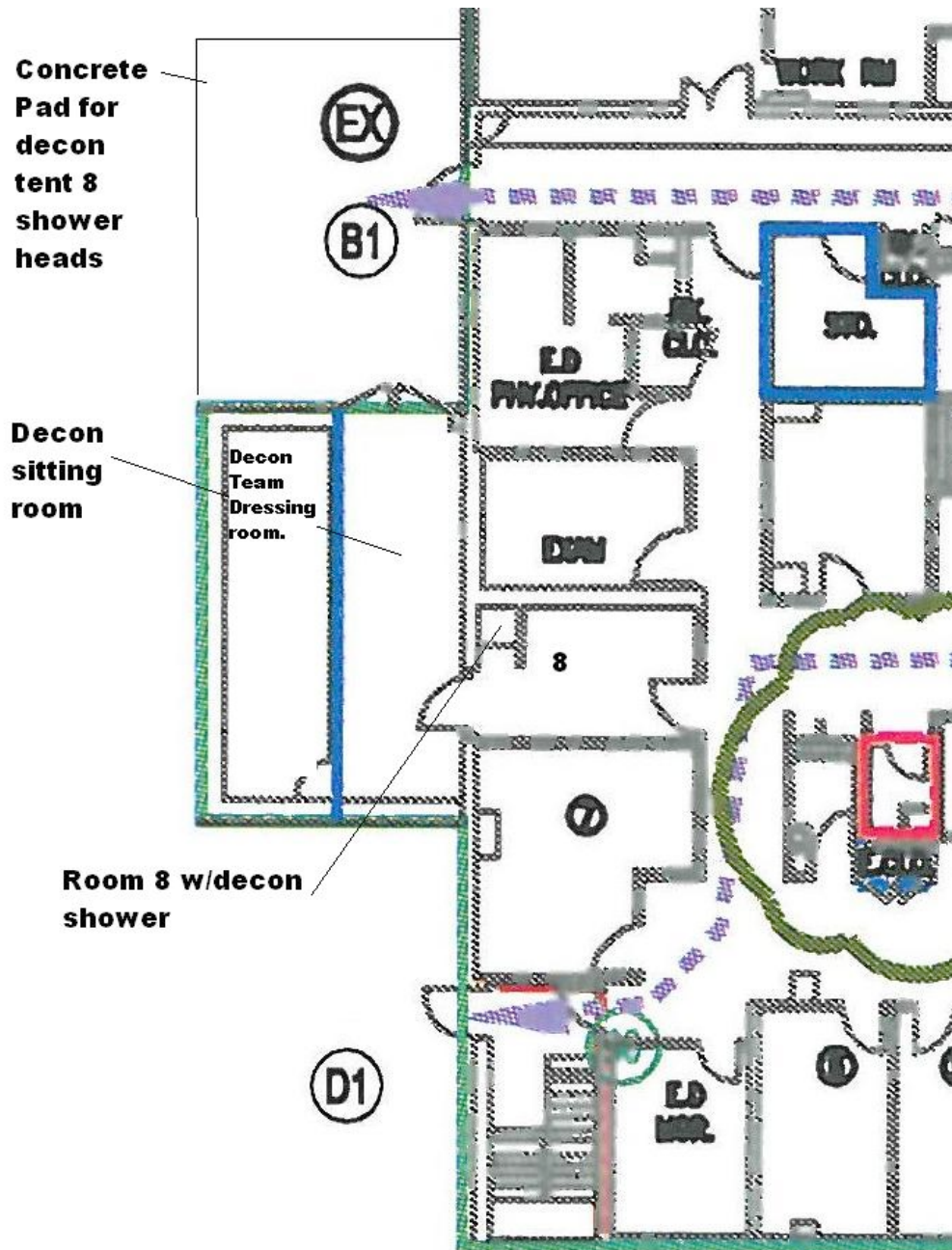
- For sites that did establish zones,
  - First responders did not observe the established zones in 50% of the exercises and observed the zone concept in 14% of the exercises (36% unreported)
  - Victims tried to leave the zoned area in 61% of the exercises and remained in a contained area in 19% of the exercises (20% not reported)<sup>xlv</sup>

**Providing awareness level training to frontline staff, reinforcing training with small-scale drills to provide opportunities for staff to recognize indicators of exposed/contaminated patients, and placing the decontamination room at the ED main entrance could minimize opportunities for contamination and cross contamination.** Such placement would also allow for continued ambulance operations (i.e., “clean” patient drop off) in an ambulance bay/garage without risk of cross-contamination. **If facility constraints do not allow for a decontamination room at the main ED area, then a small area where a patient could conduct dry self decon (i.e., clothing removal and containment) with privacy would substantially reduce secondary contamination risks.**

While a number of hospital emergency planners indicate they use their ambulance garage for patient decontamination operations, the impact of re-routing ambulances to a different entrance of a hospital needs to be considered. Not only that, the change in process for Emergency Department staff may have negative consequences for patient flow. Disaster research indicates that developing emergency procedures that align with routine procedures is key factor for successful emergency response.<sup>xlvi</sup> **Placement of the decontamination room at the front of the Emergency Department with a separate external entrance would allow for continued emergency services operations in an ambulance garage.**

An example of a facility with a direct external entrance to the decon room is at Gottlieb Memorial Hospital. During an Emergency Department remodel, Gottlieb Memorial Hospital added an external entrance to one of the treatment rooms and built a shower in the room. The back entrance has a mini waiting area with a decon team dressing room attached. The mini waiting area doubled as a way to segregate H1N1 patients; they set up a triage table in the lobby vestibule. If someone was symptomatic they were escorted around to the mini waiting area for evaluation keeping the patient population separated to prevent spread of infection. Dual use functions like this add value to the space, since hazardous materials incidents with contaminated patients presenting to the Emergency Department are not common. Dual functional use space, without impacting the ability to immediately activate the decon room, should be considered.





An additional risk to Emergency Department operations that is often recognized is a single entry/exit route into the Emergency Department; this can result in a shut down main entrance activities during a hazardous materials event. **Planning a secondary entrance, which could be emergency egress doors routinely, would help to alleviate the potential of having to vastly change Emergency Department front entrance processes when a contaminated patients causes the primary entrance to be contaminated.** Considering that lost revenue for ED operations interruption is, implementing options to minimize the risk of the need to shut down ED operations during a hazardous materials event may be warranted.

## DECON TEAM STAFFING

Decon team staffing challenges are common. At many hospitals, ED nursing staff support decon team staffing. During a mass casualty incident that involves contaminated victims, these clinical staff are drawn away from clinical duties, thereby increasing the gap between clinical providers and patient care needs. Therefore, **hospitals should seek to minimize clinical staff on patient decontamination needs and maximize support from work areas that would not generally have a “surge” of additional work during a mass casualty incident.**

Feedback from healthcare preparedness group on LinkedIn and the listserv from Business Continuity Workgroup for Healthcare Professionals in 2011 indicate variety of staff are used to support decontamination operations, including:

- Anyone willing to go through the training/All Departments (Volunteer)
- Accounting
- Administration
- Ancillary Staff (non-licensed staff)
- BioMed (Clinical Engineering)
- Business Office Staff
- Community Emergency Response Team
- Critical Care Technicians
- Dietary
- ED Healthcare Assistants
- ED Nurses (Decon Team and Decon Team Leader)
- ED Residents
- ED Technicians (i.e., Paramedics)
- EKG
- EMS (Medics)
- Engineering
- Environmental Health & Safety
- Finance
- Housekeepers/Environmental Services
- Lab
- Maintenance
- Managed Care
- Materials Management
- Med/Surge Unit Nurses
- Medical Records
- Medical Reserve Corps
- Medical Staff
- Nurse Educators
- Occupational Health
- Patient Care Services
- Pharmacy
- Plant Operations
- Radiology
- Registration
- Rehab Services
- Respiratory Therapy
- Safety
- Security (Security Functions)
- Supply Chain Management
- Support Services
- Transportation
- Volunteer Services

Tim Owen, from Bronson Methodist Hospital in Michigan recognizes the need for an organizational staffing model (not just ED) to support decontamination operations:

“For many years we have always relied on the ER department as our decon team, but have realized over time that is a poor practice as we want our specialists in ER exactly where they need to be in a disaster situation.....in the ER. We still maintain minimum training and competency on them annually... we have started to develop a response team that is multidisciplinary throughout the hospital. Anybody can join if they are interested, have management approval and want to dedicate the time.”

John Snider, Emergency Management Director from Henry Ford Health System, offers these comments:

“We make Operations training a condition of employment for Emergency Medicine, Security, and Housekeeping. In addition, we've cross trained almost 1k from ICU, PT/OT, Facilities, and any other unit that would agree to the 16 hour initial training and 4 hour annual recert. The recert is rolled into annual competencies.” (personal communication. John Snider, November 2011)

**For large scale emergencies, hospitals that are part of health systems or coalitions should consider leveraging the trained hospital decon staff from across the system/coalition.** Baylor Health Care System, a system of over 25 hospitals, created such a system wide shared plan that includes a response from the system. (personal communication. Nick Sloan, October 2011)

## APPENDIX A: GUIDELINES SUMMARY

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The following is a summary of recommendations/good practices outlined in this document:

- While performance measure may vary between hospitals, based on risk assessments, hospitals should define patient decontamination performance measures and target metrics.
- ED triage staff would benefit from clear criteria for determining which patients do not require decontamination, which require clothing control only, or which require spot or full wet decontamination.
- Developing dry self-decon procedures will minimize most secondary exposure risk to hospital facilities and personnel during a hazardous materials incident that results in mass casualties. As such, a large shower facility is not be required to effectively meet patient care needs without creating additional safety risks to staff and other occupants; however, an area to provide privacy for mass dry decontamination (i.e., disrobing and clothing containment) will be needed.
- Hospitals should minimize decontamination delays by establishing processes for patient “dry” (clothing control) self-decontamination procedures without the need for staff assistance.
- Implementing the modified Phelps/Doering decon response model would allow for immediate patient care for ambulatory patients and address the inherent delay within a hospital’s decontamination processes.
- A decontamination room that can address one-two ambulatory patients should be set up in an intuitive way that would allow ambulatory patients to perform “wet” self-decon. Implementing a Lean [5S system](#) and visual management would help create a self-decontamination capability.
- All hospitals should have the capability to conduct decontamination actions one through four in the model contained herein with the exception of activating a second team indicated in action four. Additional capability will be dependent upon the risks associated with a given community.
- ED workers should be aware that a substance poses a risk for secondary contamination if it is toxic and likely to be carried on the victim’s clothing, skin, or hair in sufficient quantities to threaten rescuers or health care providers (e.g., liquid or solid contaminant).
- Providing awareness level training to frontline staff, reinforcing training with small-scale drills to provide opportunities for staff to recognize indicators of exposed/contaminated patients, and placing the decontamination room at the ED main entrance could minimize opportunities for contamination and cross contamination. If facility constraints do not allow for a decontamination room at the main ED area, then a small area where a patient could conduct dry self decon (i.e., clothing removal and containment) with privacy would substantially reduce secondary contamination risks.
- Placement of the decontamination room at the front of the Emergency Department with a separate external entrance would allow for continued emergency services operations in an ambulance garage.

- Including a secondary entrance to an Emergency Department would help to alleviate the potential of having to vastly change Emergency Department front entrance processes when a contaminated patient causes the primary entrance to be contaminated.
- Seek to minimize clinical staff on patient decontamination teams and maximize support from work areas that would not generally have a “surge” of additional work during a mass casualty incident.
- Consider leveraging the trained hospital decon staff from across the system/coalition.

## APPENDIX B: HAZARD IDENTIFICATION SUPPORT TOOLS

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**Toxidrome Identification Decision Support Tool - [CHEMM-IST](#)** is a prototype decision support tool developed by experts in medicine and emergency response as **an aid for identifying the chemical a patient was exposed to in a mass casualty incident**. Since CHEMM-IST is currently in the prototype phase of development, it should not be used for patient care. This tool, once thoroughly tested and validated by a wide range of potential users via case studies, is intended for use by basic life support (BLS) and advanced life support (ALS) providers as well as hospital first receivers. The focus of CHEMM-IST is only on severe cases. CHEMM-IST assumes that the patient has undergone an exposure via the air, with potential toxic effects from what is inhaled from the air and also possible skin-related toxic effects from what might be deposited onto the skin from the air.

**Chemical Identification Decision Support Tool - [WebWISER](#)** - Use this tool to help **identify an unknown chemical** based on any of the following:

- Physical properties of the substance
- Signs/symptoms from exposure to the substance
- NFPA 704 full or partial placard values
- Substance categories (flammable, meth lab, etc.)
- Transport identification: DOT placard and/or type of rail car or road trailer

## APPENDIX C: HAZARD ASSESSMENT FORM

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DOT ID #: \_\_\_\_\_ NIOSH Guide ID #: \_\_\_\_\_

### MATERIAL IDENTIFICATION

Product Name: \_\_\_\_\_

Chemical/Isotope/Organism Name: \_\_\_\_\_

### MATERIAL DESCRIPTION

Solid  Liquid  Gas Appearance \_\_\_\_\_ Odor \_\_\_\_\_

### PHYSICAL PROPERTIES

Vapor Pressure:  low (0-10 mmHg)  moderate (10-100 mmHg)  high (>100 mm Hg)

Vapor Density:  heavier than air  lighter than air Water Soluble:  Yes  No  Partial

Specific Gravity:  heavier than water  lighter than water

pH \_\_\_\_\_ Flash point \_\_\_\_\_ Oxidizer:  Yes  No

Incompatible Materials (Reactivity):  Water  Bleach  Detergent  Organics

Radioactive:  Yes  No Radiation Emitted:  Alpha  Beta  Gamma

Biological Type:  Virus  Bacteria  Toxin

Other: \_\_\_\_\_

Decomposition products: \_\_\_\_\_

### HEALTH EFFECTS

Inhalation Hazard  Yes  No Effects: \_\_\_\_\_

Skin Hazard  Yes  No Effects: \_\_\_\_\_

Acute Effects: \_\_\_\_\_

Chronic Effects: \_\_\_\_\_

Latent Effects: \_\_\_\_\_

Cancer Hazard:  Yes  No Contagious:  Yes  No

### EXPOSURE LIMITS

MNOSHA Permissible Exposure Limit (PEL) \_\_\_\_\_ IDLH \_\_\_\_\_

## EXPOSURE SIGNS & SYMPTOMS

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## DECONTAMINATION CONSIDERATIONS

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## RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

- |   |   |
|---|---|
| <input type="checkbox"/> Respirator: 3M Breatheasy 10 | <input type="checkbox"/> Respirator: N-95         |
| <input type="checkbox"/> Eye/Face Splash Protection   | <input type="checkbox"/> FR-57 Cartridge          |
| <input type="checkbox"/> HEPA Cartridge               | <input type="checkbox"/> Tyvek SL Protective Suit |
| <input type="checkbox"/> Blue Nitrile Inner Gloves    | <input type="checkbox"/> Silvershield® Gloves     |
| <input type="checkbox"/> Green Nitrile Outer Gloves   | <input type="checkbox"/> Rubber Boots/Booties     |
| <input type="checkbox"/> Butyl Apron                  | <input type="checkbox"/> Butyl Gloves             |
| <input type="checkbox"/> Other: _____                 | <input type="checkbox"/> Other: _____             |



## APPENDIX D: CONTAMINATED PATIENT RESPONSE GUIDELINES

This guideline provides a general overview of pre-defined hazardous materials toxidromes/classes/groups and is not inclusive of all potential exposures or chemical contaminants. Decon team leaders/safety officers should assess and determine appropriate PPE selection, decontamination methodology, cleaning methodology and waste management disposition based on the dynamics and characteristics of a given event. The guidelines may be adapted to reflect organizational needs.

The scope of guideline is patient decontamination where the hospital is not the site of the release and should not be used by hazardous material technicians for remediation activities or chemical emergency response.

Toxidrome	Agent Class	Default PPE	Decon Considerations	Waste Management Considerations	Cleaning Considerations
<b>Unknown</b>	Unknown	<p>Ambulatory/Insignificant Contamination</p> <ul style="list-style-type: none"> <li>- Eye/Face Shield</li> <li>- Tyvek SL Suit</li> <li>- Blue Nitrile Inner Glove</li> <li>- Green Nitrile Outer Glove</li> <li>- Rubber Boots</li> </ul> <p>Non-Ambulatory/Significant Contamination</p> <ul style="list-style-type: none"> <li>- PAPR</li> <li>- Tyvek F Suit</li> <li>- Blue Nitrile Inner Glove</li> <li>- SilverShield® Glove</li> <li>- Green Nitrile Outer Glove</li> <li>- Rubber Boots</li> </ul>	<ol style="list-style-type: none"> <li>1. Clothing Control</li> <li>2. Wet Decon</li> </ol> <p style="color: red; margin-top: 10px;"><b>Secondary Contamination Risk:</b></p> <ul style="list-style-type: none"> <li>- Variable/Unknown</li> </ul>	<p>Small Event/Single Patient</p> <ul style="list-style-type: none"> <li>• Bag CONTAMINATED waste (towels, personal clothing, etc.) in plastic bag and place in 55-gallon drum in ambulance garage and close it.</li> <li>• Notify Environmental Services to remove drum from ED to safe storage location until final disposition.</li> <li>• Dump decon tank contents into the sewer water drain.</li> <li>• Communicate risk of returning patient valuables to patient/ family members and reason for the need to properly dispose of all contaminated belongings. Return uncontaminated patient belongings. Provide remuneration for clothing replacement if applicable.</li> <li>• Environmental Services/Waste Management will dispose of belongings.</li> </ul> <p>Mass Event – Notify HAZWOPER contractor to dispose of contaminated personal belongings. Request</p>	<p>Small Event/Single Patient –</p> <ul style="list-style-type: none"> <li>• Decon Team cleans room to remove visible contaminants.</li> <li>• Contact Environmental Services for final Cleaning                             <ul style="list-style-type: none"> <li>○ ES staff use Standard Precautions</li> </ul> </li> </ul> <p>Mass Event – Notify HAZWOPER contractor to clean decon area/room. Request HAZWOPER contractor information from local Fire Department (911) or MN State Duty Officer (651.649.5451)</p>

Toxidrome	Agent Class	Default PPE	Decon Considerations	Waste Management Considerations	Cleaning Considerations
				HAZWOPER contractor information from local Fire Department (911) or MN State Duty Officer (651.649.5451)	
<b>Cholinergic</b>	Organo-phosphates/ Pesticides, Chemical Warfare Nerve Agents (Liquid)	<ul style="list-style-type: none"> <li>- PAPR with FR-57 Cartridge</li> <li>- Tyvek F Suit</li> <li>- Blue Nitrile Inner Glove</li> <li>- SilverShield® Glove (if contamination is significant)</li> <li>- Green Nitrile Outer Glove</li> <li>- Rubber Boots</li> </ul>	<ol style="list-style-type: none"> <li>1. Clothing Control</li> <li>2. Wet Decon (full) with Soap &amp; Water; If <b>Organophosphate or Chemical Warfare Nerve Agent Suspected</b>; decon solution of choice is Reactive Skin Decontamination Lotion (RSDL) for localized contamination. Avoid contact with mucus membranes and open wounds.</li> </ol> <p><b>Secondary Contamination Risk:</b></p> <ul style="list-style-type: none"> <li>- Respiratory (Off-Gassing; especially if patient ingested agent) <ul style="list-style-type: none"> <li>o Low-High</li> </ul> </li> <li>- Contact</li> <li>- High</li> </ul>	<p>Small Event/Single Patient</p> <ul style="list-style-type: none"> <li>• Bag CONTAMINATED waste (towels, personal clothing, etc.) in plastic bag and place in 55-gallon drum in ambulance garage and close it.</li> <li>• Notify Environmental Services to remove drum from ED to safe storage location until final disposition.</li> <li>• Dump decon tank contents into the sewer water drain.</li> <li>• Communicate risk of returning patient valuables to patient/ family members and reason for the need to properly dispose of all contaminated belongings. Return uncontaminated personal belongings. Provide remuneration for clothing replacement if applicable.</li> <li>• Environmental Services/Waste Management will dispose of belongings.</li> </ul> <p>Mass Event – Notify HAZWOPER contractor to dispose of contaminated personal belongings. Request HAZWOPER contractor information from local Fire Department (911) or MN State Duty Officer (651.649.5451)</p>	<p>Small Event/Single Patient –</p> <ul style="list-style-type: none"> <li>• Decon Team cleans room to remove visible contaminants.</li> <li>• Contact Environmental Services for final Cleaning <ul style="list-style-type: none"> <li>o ES staff use Standard Precautions</li> </ul> </li> </ul> <p>Mass Event – Notify HAZWOPER contractor to clean decon area/room. Request HAZWOPER contractor information from local Fire Department (911) or MN State Duty Officer (651.649.5451)</p>
<b>Cholinergic</b>	Organo-phosphates/ Pesticides, Chemical Warfare Nerve	Ambulatory/Minimal Contamination: <ul style="list-style-type: none"> <li>- Standard Precautions</li> </ul>	<ol style="list-style-type: none"> <li>1. Clothing Control</li> </ol> <p><b>Secondary Contamination Risk (Solid):</b></p> <ul style="list-style-type: none"> <li>- Contact</li> </ul>	<p>Small Event/&lt; 10 patients</p> <ul style="list-style-type: none"> <li>• Bag CONTAMINATED waste (towels, personal clothing, etc.) in plastic bag and place in 55-gallon drum in ambulance garage and</li> </ul>	<p>Small Event/Single Patient –</p> <ul style="list-style-type: none"> <li>• Decon Team cleans room to remove visible</li> </ul>

Toxidrome	Agent Class	Default PPE	Decon Considerations	Waste Management Considerations	Cleaning Considerations
	Agents (Solid/Vapor)	Non-Ambulatory/ Significant Contamination: - Eye/Face Shield - Tyvek SL Suit - Blue Nitrile Inner Glove - Green Nitrile Outer Glove - Rubber Boots	- Moderate <b>Secondary Contamination Risk (Vapor/Gas):</b> - Respiratory - Low (Very Low once clothing is removed/ controlled)	close it. <ul style="list-style-type: none"> <li>Notify Environmental Services to remove drum from ED to safe storage location until final disposition.</li> <li>Dump decon tank contents into the sewer water drain.</li> <li>Communicate risk of returning patient valuables to patient/ family members and reason for the need to properly dispose of all contaminated belongings. Return uncontaminated personal belongings. Provide remuneration for clothing replacement if applicable.</li> <li>Environmental Services/Waste Management will dispose of belongings.</li> </ul> Mass Event – Notify HAZWOPER contractor to dispose of contaminated personal belongings. Request HAZWOPER contractor information from local Fire Department (911) or MN State Duty Officer (651.649.5451)	contaminants. <ul style="list-style-type: none"> <li>Contact Environmental Services for final Cleaning               <ul style="list-style-type: none"> <li>ES staff use Standard Precautions</li> </ul> </li> </ul> Mass Event – Notify HAZWOPER contractor to clean decon area/room. Request HAZWOPER contractor information from local Fire Department (911) or MN State Duty Officer (651.649.5451)
<b>Corrosive</b>	Corrosive/ Caustic Materials (Acids/Bases/ Oxidizers)	Ambulatory/Minimal Contamination: - Standard Precautions  Non-Ambulatory/ Significant Contamination: - Eye/Face Shield - Tyvek SL Suit (or better) - Blue Nitrile Inner Glove - Green Nitrile Outer Glove	1. Clothing Control 2. Wet Decon (local to burn); alkali agents may require more time to decontaminate; decontaminate to near neutral pH. Once below pH 10, continued irrigation may occur outside of the decon room to facilitate treatment.  <b>Secondary Contamination Risk:</b> - Contact Risk	Small Event/Single Patient <ul style="list-style-type: none"> <li>Bag CONTAMINATED waste (towels, personal clothing, etc.) in plastic bag. Place in 55-gallon drum in ambulance garage if patient/family does not want belongings.</li> <li>Communicate risk of returning patient valuables to patient/ family members and reason for the need to properly dispose of all contaminated belongings. Return ALL belongings to patient/ family members if requested. Provide remuneration for clothing</li> </ul>	Small Event/Single Patient – <ul style="list-style-type: none"> <li>Decon Team cleans room to remove visible contaminants.</li> <li>Contact Environmental Services for final Cleaning               <ul style="list-style-type: none"> <li>ES staff use Standard Precautions</li> </ul> </li> </ul> Mass Event – Notify

Toxidrome	Agent Class	Default PPE	Decon Considerations	Waste Management Considerations	Cleaning Considerations
		- Rubber Boots	- Low	<ul style="list-style-type: none"> <li>replacement if applicable.</li> <li>If applicable, notify Environmental Services to remove bag/drum from ED to safe storage location until final disposition.</li> <li>Dump decon tank contents into the sewer water drain.</li> <li>If applicable, Environmental Services/Waste Management will dispose of belongings.</li> </ul>	HAZWOPER contractor to clean decon area/room. Request HAZWOPER contractor information from local Fire Department (911) or MN State Duty Officer (651.649.5451)
<b>Corrosive</b>	Corrosive/ Caustic Materials (Phenol)	<p>Ambulatory/Minimal Contamination:</p> <ul style="list-style-type: none"> <li>Standard Precautions</li> </ul> <p>Non-Ambulatory/ Significant Contamination:</p> <ul style="list-style-type: none"> <li>Eye/Face Shield</li> <li>Tyvek SL Suit (or better)</li> <li>Blue Nitrile Inner Glove</li> <li>Green Nitrile Outer Glove</li> <li>Rubber Boots</li> </ul>	<ol style="list-style-type: none"> <li>Clothing Control</li> <li>Decontaminate using Polyethalene Glycols (PEG-300 or PEG-400) or a mixture of PEG-300/IMS (industrial methylated spirits) (2:1 by volume) by spraying mixture on burn or swabbing burn for two minutes. Water is an alternate decon solution.</li> </ol> <p><b>Secondary Contamination Risk:</b></p> <ul style="list-style-type: none"> <li>Contact Risk</li> <li>Low</li> </ul>	<p>Small Event/Single Patient</p> <ul style="list-style-type: none"> <li>Bag CONTAMINATED waste (towels, personal clothing, etc.) in plastic bag. Place in 55-gallon drum in ambulance garage if patient/family does not want belongings.</li> <li>Communicate risk of returning patient valuables to patient/ family members and reason for the need to properly dispose of all contaminated belongings. Return ALL belongings to patient/ family members if requested. Provide remuneration for clothing replacement if applicable.</li> <li>If applicable, notify Environmental Services to remove bag/drum from ED to safe storage location until final disposition.</li> <li>Dump decon tank contents into the sewer water drain.</li> <li>If applicable, Environmental Services/Waste Management will dispose of belongings.</li> </ul>	<p>Small Event/Single Patient –</p> <ul style="list-style-type: none"> <li>Decon Team cleans room to remove visible contaminants.</li> <li>Contact Environmental Services for final Cleaning <ul style="list-style-type: none"> <li>ES staff use Standard Precautions</li> </ul> </li> </ul> <p>Mass Event – Notify HAZWOPER contractor to clean decon area/room. Request HAZWOPER contractor information from local Fire Department (911) or MN State Duty Officer (651.649.5451)</p>
<b>Corrosive</b>	Corrosive/ Caustic Materials (HF)	<p>Ambulatory/Minimal Contamination:</p> <ul style="list-style-type: none"> <li>Standard Precautions</li> </ul> <p>Non-Ambulatory/</p>	<ol style="list-style-type: none"> <li>Clothing Control</li> <li>Wet Decon (local to burn): <b>Water only</b>, 15-20 Minutes; Followed by topical application of calcium gluconate gel 2.5% (3.5 g USP calcium gluconate</li> </ol>	<p>Small Event/Single Patient</p> <ul style="list-style-type: none"> <li>Bag CONTAMINATED waste (towels, personal clothing, etc.) in plastic bag and place in 55-gallon drum in ambulance garage.</li> <li>Communicate risk of returning</li> </ul>	<p>Small Event/Single Patient –</p> <ul style="list-style-type: none"> <li>Decon Team cleans room to remove visible contaminants.</li> </ul>

Toxidrome	Agent Class	Default PPE	Decon Considerations	Waste Management Considerations	Cleaning Considerations
		Significant Contamination: <ul style="list-style-type: none"> <li>- Eye/Face Shield</li> <li>- Tyvek SL Suit (or better)</li> <li>- Blue Nitrile Inner Glove</li> <li>- Green Nitrile Outer Glove</li> <li>- Rubber Boots</li> </ul>	powder to 5oz/140g of water-soluble surgical lubricant); persistent pain >45 minutes post topical application may require subcutaneous injections of 5% calcium gluconate solution. 3. Ocular exposure decon solution of choice is at least 2L 1% calcium gluconate solution; Alternate irrigation choices are water or normal saline.  <b>Secondary Contamination Risk:</b> <ul style="list-style-type: none"> <li>- Contact Risk</li> <li>- Low</li> </ul>	patient valuables to patient/ family members and reason for the need to properly dispose of all contaminated belongings. Return uncontaminated personal belongings. Provide remuneration for clothing replacement if applicable. <ul style="list-style-type: none"> <li>• If applicable, notify Environmental Services to remove bag/drum from ED to safe storage location until final disposition.</li> <li>• Environmental Services/ Waste Management will dispose of belongings.</li> <li>• Dump decon tank contents into the sewer water drain.</li> </ul>	<ul style="list-style-type: none"> <li>• Contact Environmental Services for final Cleaning               <ul style="list-style-type: none"> <li>○ ES staff use Standard Precautions</li> </ul> </li> </ul> Mass Event – Notify HAZWOPER contractor to clean decon area/room. Request HAZWOPER contractor information from local Fire Department (911) or MN State Duty Officer (651.649.5451)
<b>Asphyxiant (Simple)</b>	Carbon Dioxide, Methane, Propane	Ambulatory/Gas: <ul style="list-style-type: none"> <li>- Standard Precautions</li> </ul> Non-Ambulatory/Liquid: <ul style="list-style-type: none"> <li>- Eye/Face Shield (or PAPR with FR-57 Cartridge if significant contamination)</li> <li>- Tyvek SL Suit (or better)</li> <li>- Blue Nitrile Inner Glove</li> <li>- Green Nitrile Outer Glove</li> <li>- Rubber Boots</li> </ul>	Gas Exposure <ol style="list-style-type: none"> <li>1. Clothing Control</li> </ol> Liquid Exposure <ol style="list-style-type: none"> <li>1. Clothing Control</li> <li>2. Wet Decon (full)</li> </ol> <b>Secondary Contamination Risk (Gas):</b> <ol style="list-style-type: none"> <li>1. Respiratory (None-Low)</li> </ol> <b>Secondary Contamination Risk (Liquid):</b> <ol style="list-style-type: none"> <li>1. Respiratory (Off-Gassing)</li> <li>2. Contact</li> <li>3. Low-Moderate</li> </ol>	Small Event/Single Patient <ul style="list-style-type: none"> <li>• Bag CONTAMINATED waste (towels, personal clothing, etc.) in plastic bag. Place in 55-gallon drum in ambulance garage if patient/family does not want belongings.</li> <li>• Communicate risk of returning patient valuables to patient/ family members and reason for the need to properly dispose of all contaminated belongings. Return ALL belongings to patient/ family members if requested. Provide remuneration for clothing replacement if applicable.</li> <li>• If applicable, notify Environmental Services to remove bag/drum from ED to safe storage location until final disposition.</li> <li>• Dump decon tank contents into the sewer water drain.</li> <li>• If applicable, Environmental</li> </ul>	Small Event/Single Patient – <ul style="list-style-type: none"> <li>• Decon Team cleans room to remove visible contaminants.</li> <li>• Contact Environmental Services for final Cleaning               <ul style="list-style-type: none"> <li>○ ES staff use Standard Precautions</li> </ul> </li> </ul>

Toxidrome	Agent Class	Default PPE	Decon Considerations	Waste Management Considerations	Cleaning Considerations
				Services/Waste Management will dispose of belongings.	
<b>Asphyxiant (Systemic)</b>	Isobutyl Nitrite, Carbon Monoxide, Hydrogen Cyanide, Hydrogen Sulfide	Ambulatory: <ul style="list-style-type: none"> <li>- Standard Precautions</li> </ul> Non-Ambulatory: <ul style="list-style-type: none"> <li>- Eye/Face Shield (or PAPR with FR-57 Cartridge for comfort if desired)</li> <li>- Tyvek SL Suit</li> <li>- Blue Nitrile Inner Glove</li> <li>- Green Nitrile Outer Glove</li> <li>- Rubber Boots</li> </ul>	1. Clothing Control  <b>Secondary Contamination Risk:</b> <ul style="list-style-type: none"> <li>- Respiratory (Off-Gassing)</li> <li>- None-Low</li> </ul>	Small Event/Single Patient <ul style="list-style-type: none"> <li>• Bag CONTAMINATED waste (towels, personal clothing, etc.) in plastic bag. Place in 55-gallon drum in ambulance garage if patient/family does not want belongings.</li> <li>• Communicate risk of returning patient valuables to patient/ family members and reason for the need to properly dispose of all contaminated belongings. Return ALL belongings to patient/ family members if requested. Provide remuneration for clothing replacement if applicable.</li> <li>• If applicable, notify Environmental Services to remove bag/drum from ED to safe storage location until final disposition.</li> <li>• Dump decon tank contents into the sewer water drain.</li> <li>• If applicable, Environmental Services/Waste Management will dispose of belongings.</li> </ul>	Small Event/Single Patient – <ul style="list-style-type: none"> <li>• Decon Team cleans room to remove visible contaminants.</li> <li>• Contact Environmental Services for final Cleaning <ul style="list-style-type: none"> <li>○ ES staff use Standard Precautions</li> </ul> </li> </ul>
<b>Hydro-carbon/ Halogenated Hydrocarbon</b>	A. Hydrocarbon (gasoline, propane, toluene, benzene) B. Halogenated (trichloethylene, chloroform)	Ambulatory: <ul style="list-style-type: none"> <li>- Standard Precautions</li> </ul> Non-Ambulatory: <ul style="list-style-type: none"> <li>- Eye/Face Shield (or PAPR if significant contamination)</li> <li>- Tyvek SL Suit (or Tyvek F if significant contamination)</li> <li>- Blue Nitrile Inner</li> </ul>	1. Clothing Control 2. Wet Decon (local/full; eyes – water only; skin – water/mild detergent)  <b>Secondary Contamination Risk:</b> <ul style="list-style-type: none"> <li>- Respiratory (Off-Gassing)</li> <li>- Contact</li> <li>- Low</li> </ul>	Small Event/Single Patient <ul style="list-style-type: none"> <li>• Bag CONTAMINATED waste (towels, personal clothing, etc.) in plastic bag. Place in 55-gallon drum in ambulance garage if patient/family does not want belongings.</li> <li>• Communicate risk of returning patient valuables to patient/ family members and reason for the need to properly dispose of all contaminated belongings. Return ALL belongings to patient/ family members if requested. Provide</li> </ul>	Small Event/Single Patient – <ul style="list-style-type: none"> <li>• Decon Team cleans room to remove visible contaminants.</li> <li>• Contact Environmental Services for final Cleaning <ul style="list-style-type: none"> <li>○ ES staff use Standard Precautions</li> </ul> </li> </ul>

Toxidrome	Agent Class	Default PPE	Decon Considerations	Waste Management Considerations	Cleaning Considerations
		<ul style="list-style-type: none"> <li>- Glove SilverShield® Glove (significant TCE, ketone contamination)</li> <li>- Green Nitrile Outer Glove</li> <li>Rubber Boots</li> </ul>		<ul style="list-style-type: none"> <li>remuneration for clothing replacement if applicable.</li> <li>• If applicable, notify Environmental Services to remove bag/drum from ED to safe storage location until final disposition.</li> <li>• Dump decon tank contents into the sewer water drain.</li> <li>• If applicable, Waste Management will dispose of belongings.</li> </ul>	<p>Mass Event – Notify HAZWOPER contractor to clean decon area/room. Request HAZWOPER contractor information from local Fire Department (911) or MN State Duty Officer (651.649.5451)</p>
<b>Irritant Gas</b>	<p>A. Riot Control: Pepper spray, mace, lacrimator</p> <p>B. High Water-Soluble (Acute): Ammonia, Formaldehyde, Hydrogen Chloride, Sulfur Dioxide</p> <p>C. Moderately Water-Soluble: Chlorine</p> <p>D. Slightly Water Soluble: Phosgene, Nitrogen Dioxide</p>	<p>Ambulatory:</p> <ul style="list-style-type: none"> <li>- Standard Precautions</li> </ul> <p>Non-Ambulatory:</p> <ul style="list-style-type: none"> <li>- Eye/Face Shield (or PAPR for comfort if desired)</li> <li>- Tyvek SL Suit</li> <li>- Blue Nitrile Inner Glove</li> <li>- Green Nitrile Outer Glove</li> <li>- Rubber Boots</li> </ul>	<p>Gas</p> <ol style="list-style-type: none"> <li>1. Clothing Control</li> </ol> <p>Solids</p> <ol style="list-style-type: none"> <li>2. Riot Control Agents: Decon solution of 6% sodium bicarbonate, 3% sodium carbonate and 1% benzalkylonium chloride. Alternate: Water</li> </ol> <p><b>Secondary Contamination Risk:</b></p> <ul style="list-style-type: none"> <li>- Respiratory (Off-Gassing)</li> <li>- None – Low</li> </ul>	<p>Small Event/Single Patient</p> <ul style="list-style-type: none"> <li>• <b>For Riot Control contaminants, patient decontamination should be performed after stabilization of the patient.</b></li> <li>• Bag CONTAMINATED waste (towels, personal clothing, etc.) in plastic bag. Place in 55-gallon drum in ambulance garage if patient/family does not want belongings.</li> <li>• Communicate risk of returning patient valuables to patient/ family members and reason for the need to properly dispose of all contaminate belongings. Return ALL belongings to patient/ family members if requested. Provide remuneration for clothing replacement if applicable.</li> <li>• If applicable, Environmental Services to remove bag/drum from ED to safe storage location until final disposition.</li> <li>• Dump decon tank contents into the sewer water drain.</li> <li>• If applicable, Environmental Services/Waste Management will dispose of belongings.</li> </ul>	<p>Small Event/Single Patient –</p> <ul style="list-style-type: none"> <li>• Decon Team cleans room to remove visible contaminants.</li> <li>• Contact Environmental Services for final Cleaning <ul style="list-style-type: none"> <li>o ES staff use Standard Precautions</li> </ul> </li> </ul>
<b>NA</b>	Oily, greasy, unspecified	<ul style="list-style-type: none"> <li>- Eye/Face Shield (or PAPR with</li> </ul>	<ol style="list-style-type: none"> <li>1. Clothing Control</li> <li>2. Wet Decon (Local or Full</li> </ol>	<p>Small Event/Single Patient</p> <ul style="list-style-type: none"> <li>• Bag CONTAMINATED waste</li> </ul>	<p>Small Event/Single Patient –</p>

Toxidrome	Agent Class	Default PPE	Decon Considerations	Waste Management Considerations	Cleaning Considerations
	wastes not suspected to be contaminated with pesticides, non-acidic inorganic wastes	FR-57 for comfort - Tyvek SL Suit (or better) - Blue Nitrile Inner Glove - Green Nitrile Outer Glove - Rubber Boots	as needed)  <b>Secondary Contamination Risk:</b> - Contact - Low	(towels, personal clothing, etc.) in plastic bag. Place in 55-gallon drum in ambulance garage if patient/family does not want belongings. <ul style="list-style-type: none"> <li>Communicate risk of returning patient valuables to patient/ family members and reason for the need to properly dispose of all contaminate belongings. Return ALL belongings to patient/ family members if requested. Provide remuneration for clothing replacement if applicable.</li> <li>If applicable, notify Environmental Services to remove bag/drum from ED to safe storage location until final disposition.</li> <li>Dump decon tank contents into the sewer water drain.</li> <li>If applicable, Environmental Services/Waste Management will dispose of belongings.</li> </ul>	<ul style="list-style-type: none"> <li>Decon Team cleans room to remove visible contaminants.</li> <li>Contact Environmental Services for final Cleaning               <ul style="list-style-type: none"> <li>ES staff use Standard Precautions</li> </ul> </li> </ul> Mass Event – Notify HAZWOPER contractor to clean decon area/room. Request HAZWOPER contractor information from local Fire Department (911) or MN State Duty Officer (651.649.5451)
<b>NA</b>	Radioactive Materials	<ul style="list-style-type: none"> <li>Eye/Face Shield (or PAPR with HEPA Cartridge for comfort)</li> <li>Tyvek SL Suit (or better)</li> <li>Blue Nitrile Inner Glove</li> <li>Green Nitrile Outer Glove</li> <li>Rubber Boots</li> <li>Radiation Dosimeter placed under Tyvek suit.</li> </ul>	Patient decontamination should be performed after stabilization of the patient. <ol style="list-style-type: none"> <li>Clothing Control</li> <li>Conduct pancake GM radiation survey</li> <li>If contaminated debris/dust, vacuum with HEPA filter to decontaminate patient</li> <li>Wet decon if directed by Radiation Safety/Decon Safety Officer</li> </ol> <b>Secondary Contamination Risk:</b> - Contact	<ul style="list-style-type: none"> <li>If both Pancake GM probe and wipe test are below 500 cpm, bag belongings and return belongings to patient/ family members.</li> <li>If readings are above 500 cpm, bag belongings and notify radiation experts for disposition guidance.</li> </ul> Mass Event – Notify HAZWOPER contractor to dispose of contaminated personal belongings. Request HAZWOPER contractor information from local Fire Department (911) or MN State Duty Officer (651.649.5451)	Notify radiation experts. Radiation experts will provide guidance regarding cleaning of the decon area/ room. Mass Event – Notify HAZWOPER contractor to clean decon area/room. Request HAZWOPER contractor information from local Fire Department (911) or MN State Duty Officer (651.649.5451)



Toxidrome	Agent Class	Default PPE	Decon Considerations	Waste Management Considerations	Cleaning Considerations
			- Low		
<b>NA</b>	Elemental Metals (Alkaline Elemental Metals: Lithium, Sodium, Potassium, Rubidium, Cesium, Francium)	- Standard Precautions	<p><b>WATER IS CONTRAINDICATED PRIOR TO REMOVAL OF METAL FRAGMENTS</b></p> <ol style="list-style-type: none"> <li>1. Clothing Control</li> <li>2. Cover Metal with Oil (Cooking/Mineral)</li> <li>3. Remove Metallic Fragments</li> <li>4. Skin: Wash with water for 15 minutes or longer to achieve neutral pH</li> <li>5. Eyes: Irrigate with 0.9% saline for at least 30 minutes, until pH is neutral and the cul de sacs are free of particulate material.</li> </ol> <p><b>Secondary Contamination Risk:</b></p> <ol style="list-style-type: none"> <li>1. Contact</li> <li>2. None-Low</li> </ol>	<ul style="list-style-type: none"> <li>• Dispose of Sodium Particles in Mineral Oil/Cooking Oil.</li> <li>• Bag CONTAMINATED waste (towels, personal clothing, etc.) in plastic bag. Place in 55-gallon drum in ambulance garage if patient/family does not want belongings.</li> <li>• Communicate risk of returning patient valuables to patient/ family members and reason for the need to properly dispose of all contaminated belongings. Return ALL belongings to patient/ family members if requested.</li> <li>• If applicable, notify Environmental Services to remove bag/drum from ED to safe storage location until final disposition.</li> <li>• Dump decon tank contents into the sewer water drain.</li> <li>• If applicable, Environmental Services/Waste Management will dispose of belongings and waste material.</li> </ul>	<p>Contact Environmental Services for final Cleaning</p> <ul style="list-style-type: none"> <li>○ ES staff use Standard Precautions</li> </ul>
	Elemental Metals (Phosphorus)	- Standard Precautions	<ol style="list-style-type: none"> <li>1. Clothing Control</li> <li>2. Skin: Immerse exposed areas in water or cover with wet dressings at all times. <ol style="list-style-type: none"> <li>a. Continuous tepid water irrigation can prevent further oxidation and allow removal of phosphorous particles from the skin without ignition (Mozingo et al, 1988).</li> <li>b. Particles removed should be immediately immersed in cool water to avoid ignition.</li> <li>c. Controversy exists</li> </ol> </li> </ol>	<ul style="list-style-type: none"> <li>• Dispose of Phosphorus Particles in Pure Tertbutyl Alcohol</li> <li>• Bag CONTAMINATED waste (towels, personal clothing, etc.) in plastic bag. Place in 55-gallon drum in ambulance garage if patient/family does not want belongings.</li> <li>• Communicate risk of returning patient valuables to patient/ family members and reason for the need to properly dispose of all contaminated belongings. Return ALL belongings to patient/ family members if requested.</li> </ul>	<p>Contact Environmental Services for final Cleaning</p> <ul style="list-style-type: none"> <li>○ ES staff use Standard Precautions</li> </ul>

Toxidrome	Agent Class	Default PPE	Decon Considerations	Waste Management Considerations	Cleaning Considerations
			<p>regarding the use of topical copper sulfate solution which can make debridement easier because it blackens any remaining phosphorus particles. However, it is not an antidote or neutralizing agent. It can also be easily absorbed through an open wound and potentially cause intravascular hemolysis, and acute renal and cardiovascular failure; it is not routinely recommended (Frank et al, 2008). Some authors recommend that contaminated wounds be washed several times with a solution of 5% sodium bicarbonate AND 3% copper sulfate AND 1% hydroxy-ethyl-cellulose AND 1% sodium lauryl sulfate; rinse thoroughly with saline between washings (Ben-Hur, 1978)</p> <p>d. Avoid application of any lipid or oil based ointments as these may increase the absorption of phosphorous through the skin.</p> <p>e. Visualization of phosphorus particles may be enhanced under an ultraviolet light source (black light, Wood's lamp). Phosphorus particles should fluoresce under UV light. With the exposed areas immersed in water,</p>	<ul style="list-style-type: none"> <li>• If applicable, notify Environmental Services to remove bag/drum from ED to safe storage location until final disposition.</li> <li>• Dump decon tank contents into the sewer water drain.</li> <li>• If applicable, Waste Management will dispose of belongings and waste material.</li> </ul>	

Toxidrome	Agent Class	Default PPE	Decon Considerations	Waste Management Considerations	Cleaning Considerations
			<p>loose or imbedded phosphorus particles that are visualized under UV light can be mechanically but delicately removed safely under water.</p> <p>3. Eyes: Continuously irrigate with copious amounts of tepid water for at least 15 minutes.</p> <p><b>Secondary Contamination Risk:</b></p> <ul style="list-style-type: none"> <li>- Contact</li> <li>- None-Low</li> </ul>		
	Elemental Metals (Mercury)	- Standard Precautions	<p>1. Clothing Control</p> <p>2. Soap &amp; Water Wash</p> <p><b>Secondary Contamination Risk:</b></p> <ul style="list-style-type: none"> <li>- Respiratory</li> <li>- Low</li> </ul>	<ul style="list-style-type: none"> <li>• Bag CONTAMINATED waste (towels, personal clothing, etc.) in plastic bag. Place in 55-gallon drum in ambulance garage if patient/family does not want belongings.</li> <li>• Communicate risk of returning patient valuables to patient/ family members and reason for the need to properly dispose of all contaminated belongings. Return ALL belongings to patient/ family members if requested.</li> <li>• If applicable, Environmental Services to remove bag/drum from ED to safe storage location until final disposition.</li> <li>• Dump decon tank contents into the sewer water drain.</li> <li>• If applicable, Environmental Services/Waste Management will dispose of belongings and waste material.</li> </ul>	<p>Contact Environmental Services for final Cleaning</p> <ul style="list-style-type: none"> <li>o ES staff use Standard Precautions</li> </ul>





**Organization/Assignments**

Incident Commander:

Operations Section Chief:

HazMat Branch Director:

Decon Team Leader:

Decon Safety Officer:

Skilled Personnel:

Initial Contact Unit Leader:

Setup/Support Unit Leader:

Triage Unit Leader:

Access Control Unit Leader:

Stripper/Bagger:

Washer/Rinser:

**General Responsibilities/Information Needs**

Hand out appropriate Job Action Sheet for Decon Team members to review, if necessary.  
Brief Skilled Personnel, as necessary.

**8. Summary of Current Actions**

## APPENDIX F: TECHNICAL SUPPORT REFERENCES

RESOURCE	CONTACT	SERVICES PROVIDED
<b>Poison Control Center</b>	800-764-7661	Chemical Information
<b>Local Fire Department</b>	9 1 1	Hazardous Material Response Team; Chemical Assessment Team
<b>Local Police Department</b>	9 1 1	Crowd Control Assistance
<b>Regional Emergency Protection Agency</b>	312-886-7579	Environmental Response Team Available for Technical Assistance
<b>Local Public Works (Waste Water Treatment Plant)</b>		Contact if chemicals enter the sanitary sewer waste stream. M-F 8-5
<b>HazMat Remediation/Waste Management Contractor</b>	9 1 1	Contact 911 to connect with Fire Department, or call the MN State Duty Officer (651-649-5451; 1-800-422-0798; Satellite Phone: 1-254-543-6490) to request information for certified HazMat contractors.
<b>CHEMTREC (Chemical Transportation Emergency Center)</b>	800-424-9300	24-hour emergency number. Connection with manufacturers and/or shippers who will provide advice on handling, rescue gear needed, decontamination considerations, etc.
<b>ATSDR (Agency for Toxic Substances and Disease Registry)</b>	404-639-0615	24-hour emergency number for health-related support in hazardous materials emergencies, including on-site assistance, if necessary.
<b>Bureau of Explosives</b>	202-639-2222	24-hour emergency number for hazardous materials incidents involving railroads.
<b>Emergency Planning and Community Right-to-Know Information Hotline</b>	800-535-0202	8:30 a.m. - 7:30 p.m. (EST) Provides information on SARA Title III. Provides list of extremely hazardous substances (EHS) and planning guidelines.
<b>SEMN Health-MACC</b>	855.606.5485	Contact if incident is anticipated to require additional assistance from other hospitals. Alternate contact: ARMER SE Hospital Talkgroup
<b>REAC/TS</b>	865-567-1005	24-hour emergency number for all incidents involving radiological agents.
<b>MN State Duty Officer</b>	800-422-0798	Single point of contact to call when state-level assistance is needed. Alternate Numbers: 1-800-422-0798; Satellite Phone: 1-254-543-6490)





## APPENDIX G: REFERENCES

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