



OFFICE OF
PREPAREDNESS
AND EMERGENCY
MANAGEMENT



Strategies for First Receiver Decontamination:

A collection of tactics to assist hospitals address common challenges associated with all-hazards decontamination of patients

HSPH-EPREP
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HARVARD

SCHOOL OF PUBLIC HEALTH

Emergency Preparedness and Response
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Foreword

Strategies for First Receiver Decontamination of Patients was developed by the Harvard School of Public Health Emergency Preparedness and Response Exercise Program (HSPH-EPREP) through a contract with the Office of Preparedness and Emergency Management at the Massachusetts Department of Public Health, with funding from the Office of Assistant Secretary for Preparedness and Response (ASPR) Hospital Preparedness Program.

The views and opinions expressed in this document do not necessarily represent the views and opinions of the Office of Assistant Secretary for Preparedness and Response (ASPR) Hospital Preparedness Program or the Massachusetts Department of Public Health.

A list of references used to support the development of this document can be found in Appendix C.



Background

Historically, healthcare facilities have been underprepared to care for large numbers of contaminated casualties (Wetter et al, 2001). Since the events of September 11th, 2001, acts as well as threats of terrorism involving chemical and other weapons of mass destruction, have bolstered attention toward this vulnerability, yet the potential for an accidental release associated with the ongoing production, transport, and utilization of hazardous materials is equally concerning.

Regardless of the cause of the incident, previous hazardous materials incidents have demonstrated that a large percentage of victims are likely to self-transport from the incident scene to the closest hospital for care, often arriving with little or no advance warning (Stone, 2007). Incoming victims of a hazardous materials incident may require decontamination prior to receiving definitive medical care in order to avoid compromising the integrity of the emergency department and the rest of the hospital facility.

Limited guidance surrounding first receiver decontamination, in addition to competing priorities, financial constraints, and other limitations of healthcare facilities have contributed to a significant degree of variability among hospital-based decontamination programs and capabilities. Furthermore, many widely accepted, yet continually evolving decontamination practices have not yet been quantified due to a lack of evidence-based techniques by which they can be evaluated. While further research is necessary to define optimal patient decontamination practices, hospitals may benefit from sharing best practices developed from lessons learned during participation in hazardous materials exercises and in response to real world incidents.



Scope

In 2011, through a contract with the Massachusetts Department of Public Health, the Harvard School of Public Health Emergency Preparedness and Response Exercise Program (HSPH-EPREP) engaged Massachusetts' hospitals in a series of regional tabletop exercises focused on response to a hazardous materials incident. The exercise series highlighted a significant degree of heterogeneity among hospital decontamination programs and capabilities. This finding was confirmed by subsequent onsite assessments of hospital decontamination system conducted at a representative sample of facilities throughout the Commonwealth.

To begin to address the issue of heterogeneity among hospital decontamination programs and capabilities, HSPH-EPREP developed structured tools and guides to assist hospitals develop, maintain, and augment their decontamination programs. *Strategies for First Receiver Decontamination* is a collection of tactics intended to assist hospitals begin to address common challenges and "frequently asked questions" surrounding all-hazards, first-receiver decontamination of patients. This resource serves as a companion document to the *Hospital Decontamination Self-Assessment Tool* and the *Proposed Minimum Decontamination Capabilities for Hospitals*. Specifically, each proposed minimum capability is referenced and addressed within this document, highlighting potential methods of meeting each objective.

The content presented in this document was obtained through a comprehensive literature review of regulatory guidance, national and international guidance and best practices, and recommendations from subject-matter experts, as well as from the on-site assessments of hospital decontamination systems throughout the Commonwealth of Massachusetts.

It should be noted that the strategies included in this document are presented as 'best practice' considerations only, and are not intended to replace regulatory guidance, or to serve as expectations for hospital decontamination programs and performance. Furthermore, it is understood that decontamination of patients is not the hospital's primary objective, and therefore, hospitals should operate with the principle of doing the greatest good for the greatest number. Each facility should carefully evaluate which tactics, methods, and practices will best address the needs of their patient population and surrounding community infrastructure in a decontamination response.



Assumptions

The content presented in this tool revolves around the following assumptions, which should be taken into consideration in the development, evaluation, and revision of hospital decontamination plans:

- *Hospitals will be relied upon to provide medical care to victims of a mass-casualty event resulting from a chemical, biological, radiological, nuclear, or explosive incident.*
- *All hospitals with an emergency department should be prepared to decontaminate victims in small and large- scale hazardous materials incidents.*
- *An influx of patients requiring decontamination has the potential to overwhelm any hospital.*
- *The safety of hospital personnel during decontamination operations is paramount, and should be carefully considered as a critical component of decontamination planning, training, response and recovery.*
- *The hospital's main priorities in a decontamination event are responder safety, limiting the spread of contamination, patient triage, decontamination, and medical care, as well as medical monitoring of patients and staff.*
- *Information regarding the contaminant, number of victims, and victim status may not be immediately available to hospital decontamination staff.*
- *Victims are likely to self-transport from the incident scene to the closest hospital, often arriving with little or no advance warning.*
- *Effective field decontamination resources may be limited, and hospitals should assume that all incoming victims may need to be decontaminated, unless otherwise notified by first responders.*
- *During a large-scale mass-casualty incident, hospitals should anticipate that non-symptomatic, "worried-well" victims may present to the hospital along with contaminated and/or injured victims.*
- *Victims of a hazardous materials incident may have certain access, functional, and social needs and should be accommodated to the greatest extent possible during a decontamination response. These needs should be considered in decontamination planning, training, exercise, and response.*
- *Hospitals will benefit from regular training and exercises designed to test and reinforce knowledge of hospital decontamination plans and procedures.*



Decontamination Preparedness Strategies

Challenge:

Selecting and maintaining Personal Protective Equipment (PPE) for a decontamination response

Addresses Proposed Minimum Decontamination Capability 2.2 – Decontamination Practice

Level C PPE has been broadly recommended as the minimum level of protection to be used by hospital personnel when acting as first receivers of victims contaminated with an unknown agent, yet there is little specific guidance available to assist facilities in determining the specific types and an appropriate quantities of PPE to maintain onsite. Additionally, hospitals may face logistical and financial challenges associated with the ongoing maintenance of differing types and quantities of PPE due to issues surrounding available storage space, product degradation and inventory control.

Strategies:

- 1) Consider how a routinely updated hospital and local Hazard Vulnerability Analysis (HVA) can guide and streamline hospital PPE purchases. A well-developed, routinely reviewed HVA should enable hospitals to determine the greatest hazards present within their community, which in turn, may help to narrow the focus regarding which type(s) of PPE should be prioritized for purchase. Hospitals should consider working in conjunction with their Local Emergency Planning Committee (LEPC) or Regional Emergency Planning Committee (REPC) to develop and revise the HVA.
- 2) Ensure that Powered Air Purifying Respirator (PAPR) batteries are maintained and kept fully charged at all times to promote product efficacy. Consider how Biomedical Engineering or other personnel may be able to provide an ongoing support role in this regard. Additionally, the use of disposable batteries may be a preferable option to ensure proper PPE maintenance.
- 3) To avoid product degradation and preserve the shelf life associated with PAPR face shields, consider purchasing low-cost foam inserts, which are available through most medical device manufacturers. A hospital in Western Massachusetts discovered that long term storage caused the product to fold in on itself, distorting the view. Foam inserts can help to maintain the shape of the PAPR lens when not in use.



- 4) Ensure that PPE designated for training purposes is stored in a separate location from equipment used in a formal decontamination response.
- 5) Ensure that PPE is stored in a temperature controlled environment to prevent against product degradation.
- 6) Utilize rolling cabinets or carts to store PPE and other decontamination equipment in a location in close proximity to the decontamination area. Equipment should be organized and clearly labeled for quick access.

Challenge:

Ensuring 24/7 decontamination team coverage

Addresses Proposed Minimum Decontamination Capability 2.1 – Decontamination Practice

Ensuring around-the-clock coverage of the hospital decontamination team is an essential component of an efficient decontamination response, yet hospitals may experience difficulty in identifying an adequate number of appropriately trained personnel to serve on the team without compromise to patient care. In addition, limited guidance exists regarding optimal decontamination team staffing practices.

Strategies:

- 1) Integrate decontamination team operations within the existing Hospital Incident Command System (HICS).
At a minimum, the decontamination team should consist of the following:
 - **Decontamination Team Unit Leader** (Responsible for overall decontamination operations management)
 - **Decontamination Safety Officer** (Responsible for ensuring safety of personnel and equipment within the decontamination area)
 - **Decontamination Triage Unit Leader** (Responsible for the medical assessment of patients)
 - **Decontamination Team Officers/Members** (Responsible to assist with patient decontamination procedures)
- 2) To the greatest extent possible, ensure at least two *Operations-Level trained* decontamination team members are available onsite on a 24/7 basis.



- 3) Build measures of redundancy into the structure of the decontamination team by ensuring a second team or tier of individuals are available on an on-call basis, should primary appointees be unable to respond.
- 4) Encourage volunteer decontamination team participation as opposed to mandated assignments. Personnel who voluntarily participate are likely to be more interested in and committed to the decontamination process, and responsive to requests for participation on hospital drills and exercises.
- 5) Consider how your facility might publicize and incentivize staff participation on decontamination teams. Low and no-cost tokens of appreciation can consist of gift cards, T-shirts, employee recognition via a newsletter or presentation in a meeting, as well as paid time-off to attend required trainings.
- 6) Encourage decontamination team participation from employees of various backgrounds. A mix of clinical and non-clinical personnel is optimal, including such disciplines as mental health, facilities management, engineering, and security. Consider the benefits of drawing upon personnel from non-clinical departments, as well as those with relevant backgrounds such as former military, fire services, and or hazardous materials experience.
- 7) Develop comprehensive contact/call-down lists inclusive of all personnel with a potential role on the decontamination team, as well as personnel and/or agencies providing support to the decontamination team.
- 8) Identify a method of immediately alerting decontamination personnel of team activation. Consider the benefits of utilizing a mass alerting system capable of reaching recipients within minutes via text, pager, phone, and/or email capability.
- 9) Develop decontamination team-specific Job Action Sheets (JAS) to provide information regarding essential functions to decontamination team personnel. Examples of decontamination team job action sheets can be accessed at:
http://www.enmagine.com/images/shared/Download_Central/Hazardous_Materials/HazMat%20Incident%20Command/hics_HazMatDeconJobActionSheets_EnMagine.pdf and <http://www.nyc.gov/html/doh/downloads/pdf/bhpp/bhpp-focus-hosp-chpprot-decon.pdf>.



10) Investigate how your facility might partner with hazardous materials training centers and other similar entities offering educational resources appropriate for decontamination teams. For example, the DelValle Institute for Emergency Preparedness in Boston, MA, offers hazardous materials and other all-hazards emergency preparedness education and training for emergency management, community and private sector partners.

Challenge:

Ensuring staff are appropriately trained to identify and decontaminate contaminated patients

Addresses Proposed Minimum Decontamination Capability 1.2 – Early Incident Recognition

While the importance of a robust, well-trained hospital decontamination team and a hospital-wide awareness hazardous materials awareness program is well-recognized, competing priorities, financial constraints, and other facility-specific challenges such as high rates of staff turnover may impede progress towards these goals. In addition, traditional hazardous materials training programs are largely focused on first-responder objectives, and may fall short of addressing the most critical elements of first receiver decontamination. Lastly, unfamiliar concepts and procedures associated with hazardous materials training may not be well-retained by staff if a mechanism does not exist with which they can be regularly reinforced.

Strategies:

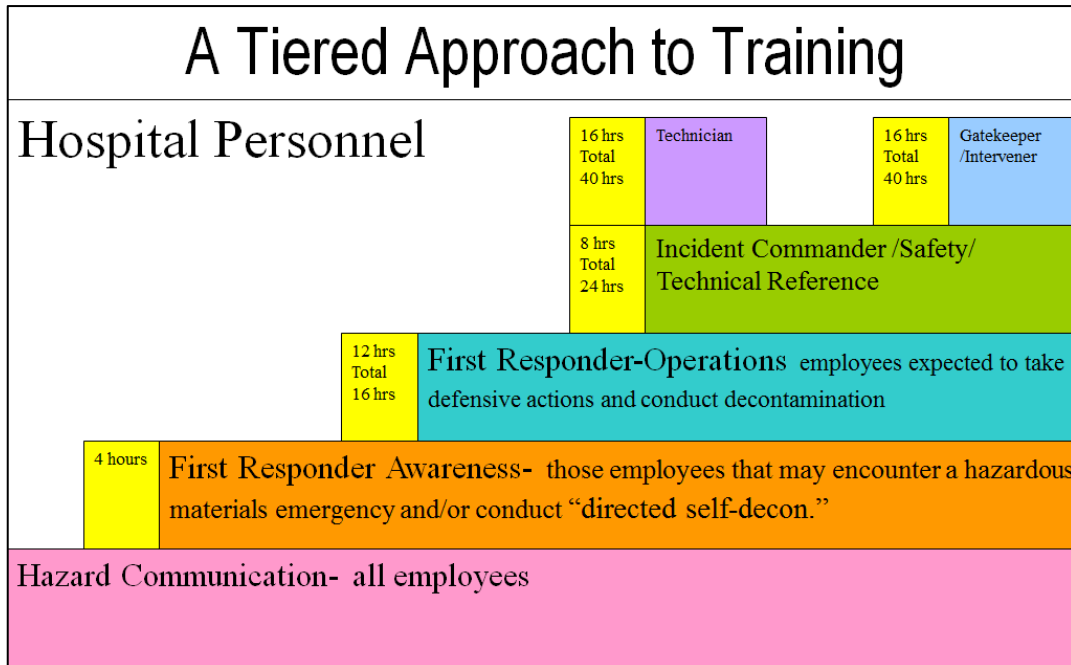
- 1) If possible, train and appoint internal personnel to serve as Train-the-Trainer instructors of an in-house hazardous materials training program. Doing so may yield the following:
 - *A reduction of costs associated with ongoing external/vendor training;*
 - *Increased flexibility with staff schedules and hospital-specific requirements;*
 - *Promotion of a hospital-centric training approach to hazardous materials incidents;*
 - *Streamlined training concepts and objectives based on the specific hazards and characteristics of the surrounding community; and*
 - *Ongoing study with familiar personnel and use of internal hospital equipment.*



- 2) Modify the traditional OSHA Hazwoper Hazardous Materials training curriculum to meet the specific needs of your facility. As an example, routine eight hour training blocks can be broken down into half-hour or one-hour monthly module increments or other format designed to work within the time constraints of staff schedules. This model of study may foster skills retention, as it provides ongoing opportunities for staff to reinforce new concepts as well as practice decontamination procedures, donning and doffing PPE, etc.

- 3) Promote a tiered approach to hazardous materials training in order to ensure that personnel are trained according to the specific responsibilities associated with their job function and/or role in the decontamination response. As an example, EnMagine Inc.'s "Hazmat for Healthcare" Program developed such a model, as depicted below in **Figure 1**. Additional information on this model and similar resources are described in the *Safety Manual to Healthcare Professional Safety Certificate Program* at: <https://www.iahss.org> or <http://www.enmagine.com>

Figure 1: A Tiered Approach to Training (Penn, 2002)





Challenge:

Promoting situational awareness between first receivers and first responders during a hazardous materials incident

Addresses Capability 1.1 – Early Incident Recognition

Maintaining situational awareness among first receivers and first responders is a critical component of any emergency situation, yet arguably, even more necessary when dealing with the presence of potentially unknown chemical, biological, radiological, or nuclear agents. Developing collaborative protocols and procedures in advance may promote a common operating picture and facilitate a more unified, efficient community response to a hazardous materials incident.

Strategies:

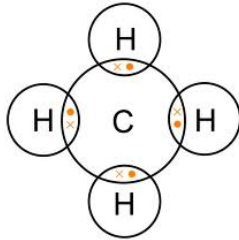
Development of a two-way communication protocol

- 1) In conjunction with first responder agencies, evaluate how tools such as the **METHANE Report** can be used to facilitate two-way communication during a hazardous materials response. (Emergency Medicine Society of South Africa, 2008) This incident management and communication tool is intended to be used as a community model among first responders and first receivers as a way of developing a common operating picture during a hazardous materials incident. It is important to incorporate the use of such tools into hazardous materials trainings, drills and exercises in order to ensure their efficacy during an actual event. *The seven-stage METHANE Report process is depicted on the following page.*



Figure 2. METHANE Report

METHANE Report



My call sign/name/appointment *(Example: Incident Commander at scene)*

Exact location *(1212 Smith Street)*

Type of incident *(Chemical release)*

Hazards, present and potential *(Chlorine)*

Access to scene *(Scene on lockdown)*

Number and severity of casualties *(10 symptomatic)*

Emergency services present and required *(HazMat on scene providing gross decon)*

- 2) In conjunction with the LEPC, REPC, or other multidisciplinary emergency preparedness forum, facilitate a process to designate a central coordinating body responsible for alerting and providing ongoing situational awareness to hospitals and other emergency management partners within a specific geographic area of a hazardous materials incident. Alerting mechanisms should be redundant and capable of reaching intended recipients within minutes through such channels as mass texting, calling, paging, and/or emailing capabilities.
- 3) In conjunction with the LEPC, REPC, or other multidisciplinary emergency preparedness forum, develop and utilize web-based tools or other platforms to allow real-time information sharing between first responders and first receivers.





Decontamination Response Strategies

Challenge:

Ensuring a timely, appropriate activation of the hospital decontamination plan

Following initial notification about a potential hazardous materials incident, hospital personnel may experience uncertainty in anticipating *when* and *to what level* to activate the hospital decontamination plan and mobilize necessary resources, particularly when incident information is ambiguous. While a premature activation during a “false alarm” could result in a costly and unnecessary deployment of resources, a delayed response to an actual incident could produce far more dire consequences for patients and first receivers alike. This challenge may be particularly apparent if collaborative relationships with first responder agencies have not been established ahead of time, and if information sharing protocols and procedures have not been sufficiently developed and tested.

Strategies:

- 1) Consider how development of a phased alert and activation protocol may allow hospitals to appropriately and proactively react to initial information regarding a potential threat to hospital safety. A consortium of acute care hospitals, in collaboration with local first responder agencies in the Washington, D.C. area, developed such an alerting protocol to facilitate timely, appropriate activation of hospital decontamination resources. The protocol is comprised of two distinct alerts that correspond with appropriate activation levels, and is described in further detail below. (Capitol Region MMRS, 2003)

A **DECON ALERT** is implemented when a hazardous materials incident has been reported, but the number of victims and/or need for decontamination has not yet been determined. At this level of alert, hospitals will:

- *Conduct a thorough check of decontamination equipment and resources, to ensure it is ready for use should the alert be elevated to a full activation level;*
- *Evaluate the need for ambulance diversions;*
- *Alert and increase security presence;*
- *Evaluate the need to alter ED waiting room isolation protocol; and*
- *Notify secondary health facilities about the initiated decontamination alert.*



In contrast, a **DECON STANDBY** is implemented by the hospital when enough information is available to confirm that a hazardous materials incident has occurred, and that decontamination is required before victims can receive medical attention and/or be released. Specific details concerning the agent in question may not be available. At the standby level of activation, hospitals will:

- *Immediately deploy the decontamination team and equipment;*
- *Implement hospital lock-down procedures, ensuring a single point of access and egress to avoid facility contamination; and*
- *Notify secondary health facilities about the initiated decontamination standby activation.*

Challenge:

Determining an appropriate course of action when information from the incident scene is unavailable

Addresses Proposed Minimum Decontamination Capability 2.3 – Decontamination Practice

The arrival of patients seeking care may often be the first signal to the hospital that a hazardous materials incident has occurred, a phenomenon evident during the 1993 World Trade Center bombing, the 1995 Oklahoma City bombing and Tokyo Sarin Attacks, and the 2001 Terrorist Attacks in New York City and Arlington, Virginia. (Pye, n.d.) First responders may be unable to relay information regarding the agent in question, the number, age, and status of victims, and other incident details to first receivers on a timely basis due to their involvement at the scene. In such instances, hospital personnel should have a process in place to obtain on-demand guidance and subject matter expertise and determine the best course of action to facilitate a decontamination response.

Strategies:

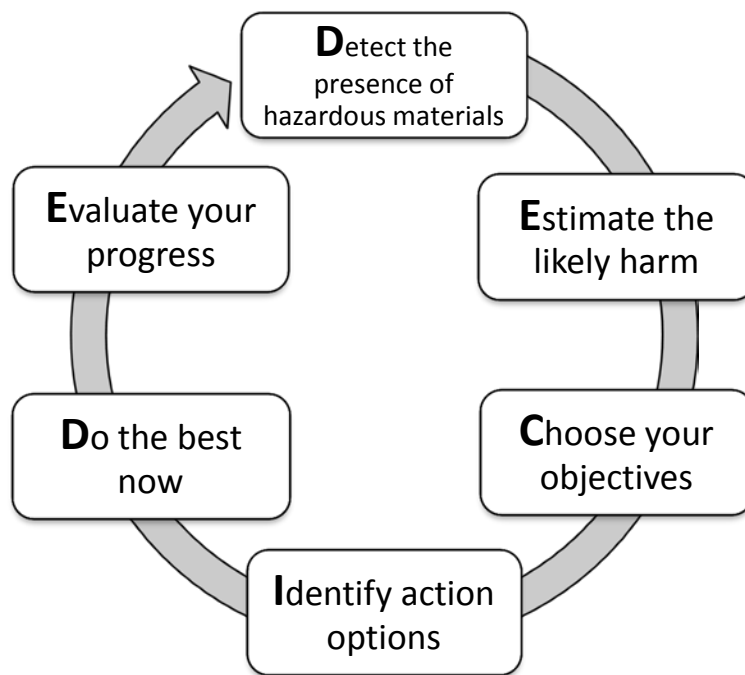
- 1) Develop a partnership with an entity capable of and willing to provide around-the-clock subject matter expertise regarding definitive care procedures for contaminated and/or exposed patients (such as Poison Control). Consider how development and testing of written protocols and/or Memorandums of Agreement (MOAs) in advance of an incident can facilitate a more efficient timely response during a hazardous materials incident.



- 2) Identify and train staff to utilize an information resource center or other method to obtain on-demand, expert guidance regarding the properties of and suggested response actions concerning chemical, biological, and radiological agents. As an example, CHEMTREC is a no-cost resource providing around-the-clock, expert guidance on response to hazardous materials incidents. More information about this service is available at: <http://www.chemtrec.com/responder/Pages/default.aspx>

- 3) Evaluate how the **DECIDE Process** may assist personnel in determining the best course of action to take at various intervals of a hazardous materials emergency. (St. Barnabas Health Care System, n.d.) *The DECIDE Process is depicted below.*

Figure 3. DECIDE Process





Challenge:

Preventing contamination of the hospital facility

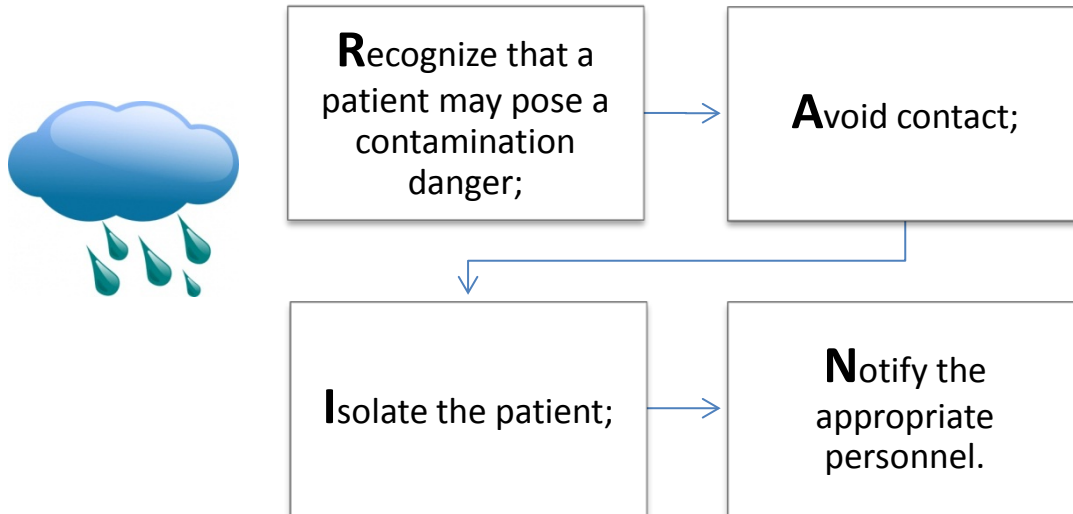
Addresses Proposed Minimum Decontamination Capability 1.2 – Early Incident Recognition

Past mass decontamination incidents have demonstrated that a significant percentage of victims are likely to self-transport from the incident scene to the closest hospital, often arriving with little or no advance warning. Following the Tokyo Subway Sarin Attacks in 1995, over 4,000 victims self-presented at hospitals in comparison to the 688 victims transported by first responders. (Okumura et al, 1998) Even in small scale hazardous materials incidents, it is possible that victims may choose to self-transport, thereby bypassing routine first responder channels through which a hospital may receive advance notification. A single contaminated patient accessing the emergency department has the potential to cripple routine operations and cause serious disruptions to patient care. For this reason, front line personnel (such as Security, Patient Registration, Reception, etc.) must be alert to the signs and symptoms of patients who have been contaminated and appropriately implement security and access control plans to prevent unauthorized patient access to the emergency department.

Strategies:

- 1) Display pictorial reference guides in the hospital emergency department that clearly depict signs and symptoms typical of hazardous materials contamination and exposure. As an example, the University of North Carolina at Chapel Hill compiled a matrix of chemical terrorism agents and corresponding signs/symptoms, and the Minnesota Department of Public Health created an illustrative chemical terrorism informational poster to promote early detection. These resources are available at <http://healthvermont.gov/emerg/wallchart.pdf> and <http://www.health.state.mn.us/divs/phl/labep/posters.html>.
- 2) Evaluate how the use of simple mnemonics such as the **R.A.I.N** Acronym (Pye, n.d.) may assist front-line hospital personnel recall the appropriate measures to take when responding to a potential hazardous materials incident. *The RAIN Acronym is depicted on the following page.*

Figure 4. RAIN Acronym



- 3) Require hazardous substance contamination awareness training for all front-line personnel. Awareness level training is designed to provide a basic understanding of a hazardous materials response, and enable personnel to recognize the signs and symptoms of a contaminated patient. Front line personnel should include any persons with the potential for initial contact with an incoming patient, and may include, but is not limited to: Security, Patient Registration, Front Desk/Reception, etc. This training requirement can be included as part of the hiring process, and evaluated on an annual basis.
- 4) Consider placing color-coded bollards or other brightly colored markers throughout the decontamination area to demarcate hot, warm, and cold parameters. It is likely that patients will not fully understand the extent of the danger of contamination, and may attempt to move in and out of the warm zone, perhaps to reunite with family or friends. (Fitzgerald et al, 2003) It is also possible that hospital decontamination personnel may absentmindedly walk in and out of the cold zone. Color-specific markers can reinforce the establishment of warm and cold zones.
- 5) Consider how construction of a simple security post immediately outside of the emergency department entrance may serve as a stopgap to the hospital emergency department. One Boston area hospital recently



implemented this plan as a way of promoting early recognition of potentially contaminated patients. The post is staffed on a 24/7 basis by security guards who have received a minimum level of awareness level training as determined by the facility.

- 6) Alert staff to the possibility that incoming ambulances transporting potentially contaminated victims from the scene may have become contaminated. Precautions should be taken to limit these additional risks of facility contamination.

Challenge:

Minimizing delays in the decontamination process

Addresses Proposed Minimum Decontamination Capability 2.4 – Decontamination Practice

Before patient decontamination can commence, the hospital decontamination team must be activated and dressed in the proper PPE. Additionally, the decontamination zone must be established, and supplemental equipment, assembled. Depending on the team's level of familiarity with these procedures as well as the specific type of decontamination equipment used, it is not uncommon for this process to take upwards of 45 minutes (MDPH HazMat Tabletop Exercise Series, 2011), thereby creating the potential for significant delays in patient decontamination if more immediate measures are not put in place.

Strategies:

Improvements to Decontamination Systems

- 1) Utilize upcoming or long-term facility construction plans as an opportunity to retrofit or create new decontamination shower systems capable of receiving patients within 10-15 minutes of arrival. Emergency preparedness and/or decontamination team personnel should partner with hospital administration to ensure these changes are planned for in a manner that will meet the needs of both entities.
- 2) Construct a simple, ready-to-use, fixed decontamination shower system capable of decontaminating multiple patients simultaneously. One Boston area hospital constructed an outdoor, seven-head shower



system in their Emergency Department bay. The hospital plans to use this resource when more than one, but less than 10 patients require decontamination. This resource will allow patients to be quickly cared for, as it does not require set-up of mass decontamination resources. (See Appendix C for a picture of this shower system.)

- 3) If resources allow, consider purchasing a temporary, inflatable decontamination system that can be quickly and easily assembled. This resource can be used for mass decontamination itself or as a staging area for patients awaiting decontamination.

Promotion of self-decontamination procedures

- 4) Promote “self-decontamination” among patients as a method of decreasing delays in the decontamination process. Timely removal of contaminated clothing is widely accepted as the most critical aspect of patient decontamination (U.S. Army Chemical, Biological, Radiological and Nuclear School and U.S. Army Edgewood Chemical Biological Center, 2008) and should ideally occur within minutes of exposure. (Vogt et al, 2002) Within a staging area capable of safely holding patients awaiting full decontamination, individuals should be provided with simple instructions on how to disrobe (to ensure contamination is not further spread through movement of clothing) and supplied with sealable bags in which to place their belongings. Patients may also be provided with towels, wet wipes, etc. to remove any visible contamination on the skin. (DHS, DHHS, 2012)

Efficiency in donning PPE

- 5) Utilize every scheduled training and exercise as an opportunity for staff to practice donning and doffing protective equipment. The more familiar personnel become with these procedures, the more likely they are to efficiently don necessary equipment in a decontamination response, limiting the time until the first patient can be decontaminated.



Challenge:

Minimizing the potential for noncompliance with the decontamination process

A lack of knowledge among patients about the decontamination process may foster feelings of fear and confusion, undermine trust in hospital personnel, and potentially increase non-compliance with decontamination procedures. Several studies evaluating hospital decontamination drills yielded the following observations from interviews with volunteer patients:

- *Patients reported feeling confused about the purpose of decontamination as well as what to expect during and after the decontamination process;*
- *Patients reported feeling anxious as a result of a lack of instruction supplied by decontamination personnel;*
- *Patients experienced feelings of frustration regarding their ability to communicate with decontamination team personnel wearing PPE;*
- *Patients expressed concerns for their privacy during decontamination; and*
- *Many patients stated that in a real-world event, their experience would have caused them to question the decontamination process and/or refuse decontamination treatment. (Carter et al, 2012)*

Hospitals may benefit from the following strategies to decrease the potential for non-compliance and promote efficiency with the decontamination response.

Strategies:

Effective Communication

To the greatest extent possible, patients should be provided with situational awareness before, during, and following the decontamination process. Hospitals should develop a comprehensive crisis communications plan as a method of providing this information to patients. (AHRQ, 2005)

- 1) Conduct “Just-In-Time” information sessions with groups of patients at triage. These sessions should inform patients why decontamination is necessary and what to expect as they go through the process. Providing patients with this basic information in a clear, concise format may help to assuage patients’ concerns and facilitate a more efficient response.



- 2) Encourage patients to verbalize any questions or concerns they may have about the decontamination process.
- 3) Ensure that the decontamination zone and shower system are equipped with large, brightly colored pictograms with easy to follow, step-by-step decontamination procedure instructions. Pictograms should be placed at various stages within the warm zone and may provide patients awaiting decontamination an opportunity to mentally prepare ahead of time for the decontamination process. A consortium of hospitals in Cambridge, Massachusetts developed mass decontamination signage that can be printed at no cost and used in the decontamination zone. Pictogram examples are shown below. This resource can be accessed at: <http://www.cambridgepublichealth.org/services/emergency-preparedness/products/mass-decontamination-signs.php>. (Cambridge Health Alliance, n.d.)



Enter
Entre



Remove All
Sacarse todo



Wash
Lavarse



Cover Up
Cúbrase

- 4) Use chalk, tape, or other method of marking the ground with footprint symbols and/or phrases such as “Stand Here”, “Start Here” as a way of alerting patients where to line up and await decontamination procedures.
- 5) Encourage and train decontamination team personnel to act out key decontamination functions using broad, widely understood gestures such as hair washing, moving from station to station, etc.
- 6) Utilize a variety of methods and formats to communicate decontamination information with patients. Consider utilizing pre-recorded, looped audio and/or video messaging as a way of providing quick, basic instructions to patients awaiting decontamination procedures.



- 7) Conduct debriefing sessions with groups of patients in the cold zone following decontamination. The objective of the debriefing sessions should be to allay patients' fears of re-contamination and to provide information and resources regarding follow-up care.
- 8) Test all methods of communication to be used to support the decontamination process ahead of time, through drills and exercises. A study by Amlot et al. found that pictograms intended to simplify decontamination instructions had a seemingly opposite effect on several adult patients, who reported they had misunderstood and/or forgotten the instructions as they had been supplied before, but not inside the decontamination system. (Health Protection Agency, 2009)
- 9) Consider purchasing devices that enhance voice communication when personnel are wearing face pieces or masks.

Patient Privacy

While not *required* to ensure the efficacy of decontamination, failure to address patients' concerns of privacy during decontamination is a serious issue that may similarly undermine patient trust in hospital personnel, decrease patient compliance with decontamination procedures, and/or diminish the overall efficiency of decontamination operations. (DHS, DHHS 2012) In 1995, two female Seattle-area police officers sued a local fire department for failing to address their concerns of privacy while undergoing decontamination procedures. (Fitzgerald et al, 2003) In 2011, a lawsuit was filed by a female deputy sheriff citing privacy violation during decontamination procedures at a local hospital. Allegedly, the hospital did not provide towels or coverings to the officer following decontamination. The officer also reported that while undergoing decontamination procedures, she had been videotaped against her will by a fellow police officer, citing training purposes. (AELE, 2011)

- 1) Ensure that the decontamination shower system(s) include separate, gender-specific lanes/areas.
- 2) Affix screens, curtains, or stalls to separate each gender-specific lane within the decontamination system, as well as in between each decontamination station, if possible.
- 3) Provide patients hospital gowns or a similar covering with which to clothe themselves following decontamination.



- 4) Consider how “trash bag decontamination kits” (Continuum Health Partners, 2006) may serve as a cost-effective method of addressing patients’ privacy. Large, opaque trash bags are used in place of more traditionally used manufactured ponchos or patient gowns, providing a covering under which patients may disrobe and rinse. Kits should be pre-assembled in large (24”x30”), sealable bags which are numbered and include the following:
- One large opaque, plastic lawn-type trash bag (ideally 59 gallon, 2.0 mil thickness), pre-cut so as to use as a covering under which the patient can undress
 - One large sealable bag (24”x24”), pre-numbered) for collection of patient clothing
 - One medium sealable bag (gallon sized, pre-numbered) for collection of patient valuables (wallet, watch, etc.)
 - Wristband (pre-numbered), taped to the outside of one of the bags
 - *Optional: Tyvek or other gown/covering for patients to don following decontamination

Challenge:

Promoting clear communication among suited decontamination team personnel

While personal protective equipment is essential to protect hospital decontamination personnel operating in the warm zone, the bulky nature of the equipment (primarily noticeable with level C equipment and higher) may impede team members’ ability to communicate with each other. Clear communication is essential in order to maximize the safety of suited decontamination team personnel and to ensure an efficient response.

Strategies:

- 1) Consider purchasing a voice amplification system designed to be worn under PPE. This push-to-talk equipment enables hands-free communication capability via a 2-way radio system that is capable of operating in a variety of environments.
- 2) Consider using two-way, “temple-transducer” style radio headsets. These hands-free, behind-the head headsets are worn under the PAPR hood and may be more comfortable and functional than over the head styles. (OSHA, 2005)

- 3) Train decontamination team personnel ahead of time to use safety hand signals as a way of communicating basic functions and needs during the decontamination process. Examples of basic safety signals for decontamination team personnel as depicted by the *Southwest Texas Regional Advisory Council for Trauma EMS Hospital Disaster Group (STRAC EHDG)* can be seen below in Figure 5. Additional examples can be referenced at <http://www.nyc.gov/html/doh/downloads/pdf/bhpp/bhpp-focus-hosp-chpprot-decon.pdf>.

Figure 5: Decontamination Safety Signals



Challenge:

Conducting decontamination during periods of inclement weather

Hazardous materials incidents can occur at any time, and the decontamination of large numbers of patients may prove particularly challenging during periods of inclement weather, as decontamination typically takes place in an outdoor environment. In cold weather conditions, patients may be less likely to disrobe and comply with decontamination procedures. Additionally, there is real concern regarding the potential for cold weather injury such as cold shock and hypothermia, particularly with vulnerable patient populations. Hospitals should evaluate their capacity to decontaminate small and large numbers of patients in a variety of weather conditions, incorporating specific plans for decontamination during periods of extreme cold.

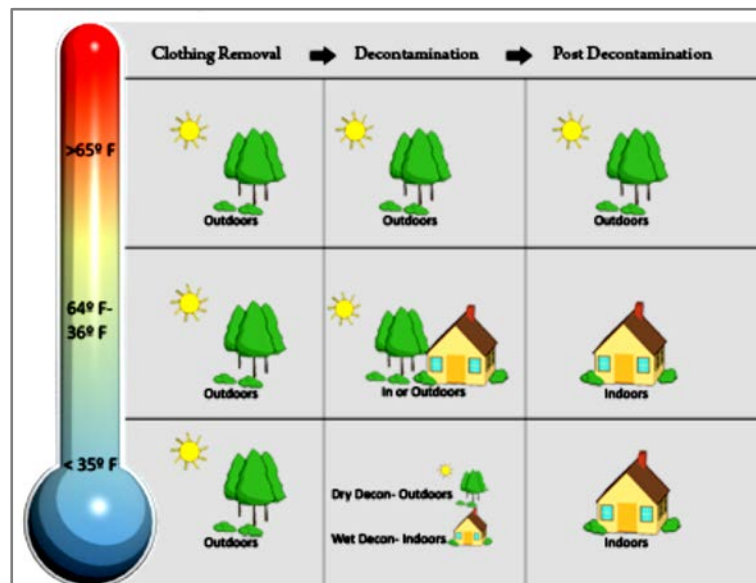
Strategies:

- 1) Anticipate that patients will be reluctant to remove clothing in cold weather environments and may be more likely to exhibit non-compliant behaviors.

- 2) Identify and provide a temperature controlled staging/holding area for patients awaiting decontamination.
- 3) Assess the situation and determine if partial or total decontamination should occur outdoors or indoors. Utilize resources to assist with this decision-making, such as the *Temperature Decontamination Guide* developed by the U.S. Army Chemical, Biological, Radiological and Nuclear School and U.S. Army Edgewood Chemical Biological Center. *The Temperature Decontamination Guide is depicted below, and can be accessed at:*

http://www.nfpa.org/~media/files/research/resource%20links/first%20responders/decontamination/ecbc_guide_masscasualtydecontam_0813.pdf

Figure 6: Temperature Decontamination Guide



- 4) Identify and provide a temperature controlled shelter for patients immediately following decontamination.
- 5) Utilize space heaters to increase the temperature within the decontamination area. It is important to follow standard safety precautions when using electrical and fuel-type space heaters within a confined area.
- 6) Minimize the distance between the triage area and the decontamination system to limit exposure to outside air.



- 7) Consider how alternate spaces may be utilized as a cold-weather decontamination area. One large, metropolitan Boston area hospital plans to turn their parking garage into a decontamination area during periods of extreme cold. Exposed areas of the garage will be covered with large tarps, and the area will be warmed by portable heaters. Patients will immediately be taken indoors following decontamination.
- 8) Inquire about any pre-existing medical conditions patients may have prior to decontamination.
- 9) In periods of extreme cold, consider utilizing dry decontamination procedures following the removal of clothing in instances of liquid contamination. Dry decontamination may involve the following:
 - Disrobement only;
 - Face/hand washing only;
 - Using paper towels or cloths to blot away contamination;
 - Using absorbent materials such as baking powder, Fuller's earth, dirt, etc. to absorb chemical agents;
 - Using body brushing techniques to remove dry contamination particles from clothing or the body.
- 10) Ensure that the water used within the decontamination system is able to be maintained at a tepid temperature (between 80-100 degrees Fahrenheit).

Challenge:

Addressing the specific needs of diverse patient populations in a decontamination response

Decontamination is not a one-size-fits-all procedure. Hospitals should be prepared to address the specific decontamination needs of heterogeneous, and often vulnerable patient populations including, but not limited to:

- Patients with physical and cognitive impairments;
- Infants and small children;
- "Worried-well" patients;
- Limited English Proficiency (LEP) patients/patients of different cultures;





- Non-compliant patients;
- Patients with pets and service animals; and
- Law Enforcement personnel and/or patients presenting with weapons.

Strategies:

Decontamination of patients with physical and cognitive impairments

Nearly one of every five individuals in the United States has a disability, and since not all disabilities are identifiable by sight alone, hospital personnel may not be fully aware of the specific needs of physically and cognitively impaired patients in a decontamination response. Often, even the most well-intended, pre-established plans and accommodations are not sufficient. (Taylor et al, 2009)

- 1) At triage, make a point of asking each patient if they have a physical or cognitive impairment that may require them to be assisted through the decontamination process. Post signs within the decontamination area and/or operate overhead messaging loops with this information to supplement one-on-one interaction.
- 2) Institute a *culture of care* among the decontamination team whereby each patient is treated as an expert of his or her own specific needs during the decontamination operation.
- 3) Maintain a list of patient items (electric wheelchairs, leather components, mechanical vents, hearing aids, etc.) that cannot be decontaminated without compromising the product's integrity, incorporating this information into decontamination plans, trainings and exercises. Examples of items that can and cannot be decontaminated can be accessed at: <http://www.nyc.gov/html/doh/downloads/pdf/bhpp/bhpp-focus-hosp-nyctpprot-decon.pdf>
- 4) Anticipate that the removal of adaptive equipment such as walkers, canes, eyeglasses, etc. may cause stress, fear, and a sense of lost independence among patients who rely on them. To the greatest extent possible, allowing patients to go through decontamination with these items may facilitate a more successful, efficient process for both patients and decontamination personnel. Recall that this equipment will need to be decontaminated as well. (NYCTP, 2006)





- 5) Consider how alternative equipment such as rolling shower chairs can be used to assist with decontamination of higher-functioning non-ambulatory patients. Doing so may conserve use of the traditional roller boards for more seriously impaired and/or non-responsive patients, and may free up staffing resources as it promotes self-decontamination among those that are able.

Decontamination of infants and children

Since the medical and social needs of pediatric patients differ considerably from those of adults, special measures must be taken to ensure their safety in a decontamination response. (Freyberg et al, 2008) In developing plans and procedures, it is critical to recall that infants and children may exhibit the following vulnerabilities:

- *Increased susceptibility to contaminants due to a faster rate of respiration, shorter stature, higher metabolism and rates of cellular growth, more permeable skin, and less developed immune systems*
- *Increased susceptibility to hypothermia due to larger body surface area and thinner skin*
- *Increased risk of dehydration due to a smaller volume of circulating blood throughout the body*
- *Need for different medication delivery methods and dosing requirements*
- *Decreased ability to recognize potentially dangerous situations and/or help themselves*
- *Decreased ability to comprehend decontamination concepts*
- *Fear, as a result of the appearance of PPE worn by hospital personnel*
- *The potential to become inconsolable, withdrawn or otherwise uncooperative with personnel as a result of fear* (Chicago Healthcare System Coalition for Planning and Response, 2012).

- 1) Develop a protocol for prioritizing decontamination of infants and children in both ambulatory and non-ambulatory groups.
- 2) Anticipate that decontamination of children may require additional time and staff assistance. Ensure that decontamination plans and procedures allow for this probability.
- 3) Utilize short cartoon videos and/or cartoon posters as a way of communicating basic decontamination instructions while decreasing the potential for fear among children.



- 4) To the greatest extent possible, allow families to undergo decontamination together. Doing so will allow parents to assist their children with proper procedures, and may help allay the fears of young children.
- 5) When possible, assign personnel of the same sex to assist older children with decontamination procedures.
- 6) When possible, allow a parent/caregiver to carry their infant through the decontamination line, with supervision and assistance from decontamination team personnel. If the infant must be separated from the parent/caregiver, consider utilizing a baby bath, stretcher/roller board, or laundry basket to carry and decontaminate the infant in, using a gentle hand-held shower sprayer.
- 7) Following decontamination, cover children in foil blankets to prevent against hypothermia.

Response to “worried-well” patients

Previous incidents have demonstrated that large numbers of worried well patients are likely to seek medical care following a large scale or widely publicized mass casualty incident. This phenomenon appears to be particularly apparent when information about the incident is communicated to the public in an ambiguous manner. (Stone, 2007) Following the Tokyo Sarin Attacks, more than four times as many worried well patients sought care than their injured counterparts. (Pilch, n.d.) Such a scenario presents a real challenge for hospitals, as large numbers of worried well patients may expend critical resources and restrict access of their contaminated and/or injured counterparts. Despite these concerns, it is faulty to assume that worried well patients are entirely without needs. Stein et al. assert that worried well patients should be thought of as patients who are “not well”, and at a minimum, require an “initial medical evaluation, understanding, guidance, and a plan”. (Pilch, n.d.)

- 1) Alter traditional perceptions of worried well patients. Worried well patients are often thought of in a negative light, when in fact, studies have shown that their behavior in response to a stressful, ambiguous situation is quite logical. Changing how this population is perceived can begin with utilizing a different term to describe them, such as “low risk”, which denotes that while they may have been exposed to some degree, they are not in need of immediate treatment. (Stone, 2007)
- 2) Recognize that worried well patients may actually be ‘low exposure’ patients. A follow up study with victims of the Tokyo Sarin Attacks found that many worried well patients denied initial care but later treated in



outpatient facilities actually had low levels of contamination, leading, in many cases, to nervous system impairment and decrease in long-term memory function. (Stone, 2007)

- 3) Triage and separate worried well patients in an area where they can be observed for potentially later-developing signs/symptoms.
- 4) Designate an alternate space where mental health practitioners and other professionals can provide psychological first aid to worried well patients. Psychological first aid should consist of the following:
 - Treating patients with compassion;
 - Providing physical and emotional comfort and support;
 - Calming and reorienting patients;
 - Identifying patients' needs;
 - Providing practical assistance, when possible;
 - Linking patients with social support networks and resources; and
 - Providing information on coping.
- 5) Depending on the scale and severity of the incident, carefully evaluate your facility's ability to successfully fully decontaminate all patients, regardless of whether they are suspected to be contaminated or not.
- 6) Identify and consider utilizing minimally invasive measures that can be taken to address patients' concerns in a way that will conserve decontamination resources. For example, a large, rural hospital in Massachusetts plans to take patients' vital signs and request a urine sample. The hospital believes this is quick, easy, cost-effective measure that can be taken to allay the concerns of worried well patients.
- 7) Consider how dry decontamination procedures may be utilized as a measure of conserving time and resources while simultaneously assuaging the fears of worried-well victims.
- 8) Provide patients with informational handouts or other resources containing general guidance about the scenario/agent involved, follow-up procedures, and any available resources in the community.
- 9) Designate a hospital phone line that patients and the public can call to obtain general information about the incident and/or follow up procedures. (KAMEDO, 2007)



Cultural sensitivity and resources for decontamination of Non-English Speaking and Limited English Proficiency (LEP) patients

Between 1980 and 2007, the number of persons in the United States speaking languages other than English at home has increased by 140%, while the general population has increased by only 34%. (U.S. Census, 2007) From 1990 to 2010, the Limited English Proficiency (LEP) population grew by 80% in the U.S. (Migration Policy Institute, 2011). Communicating decontamination procedures and other emergency preparedness concepts with patients that speak little or no English can be challenging, especially when staff are involved in the middle of a potentially stressful response. It is recommended that hospitals develop methods to successfully communicate key decontamination principles and procedures to patients ahead of time in order to facilitate an effective response.

- 1) Consider incorporating basic cultural competency training into routine training programs and sessions for hospital decontamination team personnel.
- 2) Utilize multilingual signage within the decontamination area that is most representative of the cultural populations within the community, when possible.
- 3) Consider how multilingual educational resources such as *Health Info Translations* can assist hospital decontamination personnel communicate with Non-English or Limited English Proficiency (LEP) and/or hearing-impaired patients in a hazardous materials response. Health Info Translations is a database of simple, easy to read educational materials, providing audio, video, and written instructions on many health topics, including decontamination, in over 17 languages as well as in American Sign Language. Resources can be accessed at: <https://www.healthinfotranslations.org/>
- 4) Maintain awareness about and sensitivity towards the values, gender roles, and social norms of different cultures. For example, maintaining eye contact is not always appropriate in some cultures. Pay attention to the patient's comfort level when speaking to them and making eye contact.
- 5) When possible, include interpreters/bilingual personnel on the hospital decontamination team as well as in the cold zone. As with other resources, interpretive services should be available for the languages/cultures most significantly represented in the surrounding community.
- 6) When utilizing interpretive services, look at and speak directly to the patient, rather than the interpreter.



- 7) If possible, allow LEP and/or Non-English speaking patients to undergo decontamination with others who speak their language. A decontamination exercise conducted by Taylor et al. in 2009 found that Spanish-speaking patients were reportedly more at-ease with decontamination procedures when accompanied by other Spanish-speaking individuals. (Health Protection Agency, 2009)

Response to non-compliant patients

Contaminated patients refusing to comply with decontamination procedures may pose a risk of cross-contamination to hospital staff, other patients, and the hospital facility, yet attempts to force patients to undergo procedures are largely unsuccessful and ethically questionable. (Capitol Region MMRS, 2003). During a decontamination response to a suspected white powder release in Washington, D.C., attempts to control non-compliant “victims” resulted in “contaminated” law enforcement officers acting aggressively and striking the first responders. During a 1999 response to a pesticide release, first responders forcibly removed the clothing of non-compliant victims, who later reported feeling humiliated, fearful and distrusting of responders. (Carter et al, 2013) Hospitals should be prepared to appropriately respond to patients refusing to participate in decontamination procedures.

- 1) Anticipate and recognize that patients who are unwilling to undergo decontamination may present with a variety of signs and symptoms, including, but not limited to:
 - Agitation;
 - Intoxication;
 - Irrational behavior;
 - Self-inflicted injury or threats of self-injury;
 - Limited cognitive ability; and
 - Unexplained attitude of ambivalence.
- 2) Approach individuals from the front, while maintaining eye contact, and speaking in a controlled, even tone.
- 3) Avoid touching or pointing at the patient, and refrain from speaking in a loud tone or talking down the individual.



- 4) Provide mental health/counseling assistance, as some patients may simply need to be reassured of the purpose of decontamination and of their safety throughout the process.
- 5) On a case-by-case basis only, evaluate if certain aspects of decontamination plans/procedures might be modified to accommodate the request of the patient. When doing so, the safety of staff, other patients, and the facility should be prioritized.
- 6) Immediately assess the potential for cross-contamination to others and maintain detailed records of the incident. Documentation should include the name and address of all patients refusing decontamination, along with a description of what occurred. This information can be of assistance when/if the patient requires follow-up care and can also be shared with local public health authorities as needed.

Decontamination of patients with service animals

In the aftermath of Hurricane Katrina, the PETS Act of 2006 was created to ensure that state and local emergency management partners address the specific needs of individuals with service animals and pets before, during, and after disasters. (ASPCA, 2013) As with other patient populations, hospitals may benefit from an awareness of various planning considerations to address the needs of contaminated patients presenting with service animals. (DHS, DHHS, 2012)

- 1) Describe the decontamination process, explaining specific procedures that will be used on the animal with the owner.
- 2) Obtain contact information of a secondary caregiver for the animal in the event that the owner must stay at the hospital for further care.
- 3) If possible, allow the service animal to go through the decontamination process with the owner to promote patient safety and comfort.
- 4) Utilize moist towelettes to decontaminate the areas around the animal's eyes, nose, mouth, and in ears, where traditional washing methods may be more difficult.



- 5) Consider using a muzzle on the animal to prevent it from licking/drinking contaminated water, or biting service personnel.
- 6) Ensure that extra attention is directed towards decontamination of the animal's paws, as particles can easily become trapped in the deep creased edges of the paw pad.
- 7) Utilize child gates or other functional barriers to protect against a potential spray of water from animals' natural tendency to shake when wet. (Gordon, 2008)

Decontamination of Law Enforcement personnel and/or patients presenting with weapons

It is likely that law enforcement personnel who have been injured in a hazardous materials incident will have had their weapon(s) removed prior to transfer to the hospital for care. Yet, in a chaotic environment, it is possible that this step could be overlooked, or that civilians presenting to the facility may be carrying firearms or other weapons. In order to ensure safety in a decontamination response, hospitals should develop a protocol to address such scenarios in conjunction with their firearms policy.

- 1) If permitted by the hospital firearms policy, remove the gun belt, ensuring the weapon remains within the holster, and store it in a clear, sealable plastic bag labeled with the patient's name or other source of identification. The sealed bag should then be transferred to the custody of law enforcement for safekeeping. In the event that the weapon cannot be left in the holster, it should only be removed by a decontamination team member who is familiar with firearms and designated to do so per the hospital's firearms policy. Decontamination of the weapon, belt, and all other associated equipment is the responsibility of law enforcement personnel.
- 2) Remove ballistic vests by loosening the Velcro straps and pulling the vest apart and off the patient. Similar to the procedure for weapons, the vest should be bagged, sealed, documented, and transferred to a law enforcement officer.
- 3) Anticipate the possibility that law enforcement personnel may be carrying a secondary weapon. Decontamination team personnel should carefully check in the patient's pockets and around ankles and chest area where holsters are usually worn (EnMagine, 2013).



Challenge:

Ensuring the effectiveness of decontamination

Many sources assert that the removal of contaminated clothing accounts for an 80-90 percent contaminant reduction, yet there is presently no quantifiable, evidence-based method available with which to evaluate this claim. (DHS, DHHS, 2012) According to the Agency for Toxic Substances and Disease Registry (ATSDR) “effective decontamination consists of making the patient As Clean as Possible (ACAP) [meaning that] the contamination has been reduced to a level that is no longer a threat to the patient or to the responder”. (DHHS, 2001) Absent a scientifically tested protocol to evaluate “cleanliness” following completion of decontamination procedures, there are measures hospitals can take to follow ACAP guidance and reduce the likelihood of lingering contamination.

Strategies:

- 1) Incorporate a primary water rinse station in the decontamination shower system. It may be beneficial for patients to immerse themselves under a deluge of water only for a minimum of 30-60 seconds prior to advancing to supplemental soap and rinse stations.
- 2) Incorporate programmable timers within the decontamination showers that are capable of operating via an on/off feature, and/or sound an alarm to notify the patient when to move to the next station.
- 3) Purchase one or more radiological monitoring devices to survey patients for thorough decontamination following exposure to radiation.
- 4) To the greatest extent possible, visually inspect patients for signs of lingering contamination.

Challenge:

Identifying plans and procedures for handling the contaminated deceased

While it is assumed that decontamination team personnel have been trained to operate in potentially contaminated environments, they may not be experienced with procedures for handling and processing



remains. (SBCCOM, 2000) Furthermore, hospital mortuary personnel may not be appropriately trained to recognize the dangers associated with chemically contaminated casualties or may not have access to the appropriate PPE. The contaminated deceased may pose an ongoing risk to hospital and other personnel if not handled properly. In instances of chemical contamination, for instance, the potential for “off-gassing” can occur, particularly if bodies are stored in a closed-off space where concentrations of the agent can reach toxic levels. (Continuum Health Partners, 2006)

Strategies:

- 1) Evaluate your facility’s ability to thoroughly decontaminate deceased patients before they are released to the morgue or coroner’s office. Decontamination of the dead should occur in an area that is separate from the main decontamination area and located away from the view of the public.
- 2) Evaluate whether your facility has the necessary resources available to store contaminated bodies until they are picked up by mortuary personnel or an alternate determination is made as to their next destination. Bodies should be stored in air-tight, marked body bags in an outdoor location away from the view of the public.
- 3) Recall that a criminal investigation will be necessary in the event that an intentional hazardous material release/act of terrorism is suspected. Consider developing plans/procedures in conjunction with Law Enforcement personnel regarding the collection of clothing and personal effects from the deceased for analysis purposes. In such an instance, all actions taken by the hospital and decontamination team should be thoroughly documented.
- 4) Encourage local coroners, funeral directors, and other mortuary personnel to participate on hospital and community-based hazardous materials exercises and planning initiatives. Doing so may facilitate interdisciplinary awareness about the unique challenges each may face in a hazardous materials response and may foster ongoing collaboration.





Challenge:

Augmenting hospital decontamination plans, procedures, and capabilities through well-developed drills and exercises

Addresses Proposed Minimum Decontamination Capability 3.1 – Evaluating the Effectiveness of Decontamination Programs

Perhaps the most integral component of ensuring an efficient, effective decontamination response is the hospital's commitment towards regular decontamination and hazardous materials training and exercise. Prioritizing such drills and exercises enables staff to become more familiar with equipment, skills, and concepts, and scenarios they may otherwise be unaccustomed to. Additionally, regular participation in exercises can create an opportunity for identification of new solutions to common challenges, and can foster collaboration with community partners involved in the response.

Strategies:

- 1) Conduct at least one decontamination exercise annually, whereby all decontamination equipment is fully utilized to test its effectiveness. At a minimum, the following elements should be included:
 - Running of water through all pipes and shower heads (30 minute minimum);
 - Operation of all engines, motors, generators and heaters (30 minute minimum);
 - Donning and doffing of full PPE.

- 2) Consider using external evaluators such as contracted vendors, staff from surrounding hospitals, and/or qualified community partners in addition to internal personnel to observe and assess hospital performance on decontamination drills and exercises. While internal evaluation is essential, an external perspective may help to reduce the potential for unintentional bias and help to identify areas for improvement in hospital decontamination preparedness and response. In addition, bringing in outside personnel may promote mutual learning and foster relationship-building, which is critical for a community's successful response to hazardous materials incidents.

- 3) Consider video-recording partial or total portions of decontamination drills and exercises, for the purpose of review on an as-needed basis. Doing so may be a cost-effective method of allowing hospital personnel to



increase improvement plan accuracy, which may often prove challenging due to the potential for observer bias, accurate incident recall during a stressful response, and/or incomplete written evaluations.

- 4) In addition to collecting exercise evaluation forms and conducting a large group hotwash, conduct interviews with volunteer patients/participants to collect more specific, and valuable data on their perceptions of the decontamination process.
- 5) Ensure that exercise participants are representative of the hospital's actual patient populations. Doing so should allow a more realistic picture of potential training and resource needs for a real-world response. As an example, a Chicago-area healthcare coalition recruited participants for a hospital decontamination exercise mirroring their patient population, which is largely comprised of Spanish-speaking and deaf individuals. As a result, hospitals identified gaps in their plans and procedures, made recommendations for improvement, and most importantly, recognized the "universal benefit" in incorporating the needs of special populations into a system-wide decontamination operation. (Chicago Healthcare System Coalition for Planning and Response, 2012)
- 6) Involve the local community in hospital decontamination drills and exercises. Consider publicly advertising upcoming decontamination drills and exercises to solicit participation. Doing so may alert the hospital to currently unmet needs, while educating the public about hazardous materials incidents and the decontamination process.
- 7) Ensure that all decontamination drills and exercises are followed by a written After Action Report (AAR) to document key findings from the exercise.
- 8) Develop a process for the sharing of information and lessons learned from decontamination drills and exercises. Consider submitting finalized AARs or case studies to the Federal Emergency Management Agency's Lessons Learned Information Sharing network (FEMA LLIS) to assist other facilities improve upon decontamination capabilities. The LLIS database can be accessed at: <https://www.llis.dhs.gov/>. In addition, consider how your facility might share lessons learned within a hospital/healthcare coalition, emergency preparedness committee, or other collaborative forum to promote relationship-building and foster community readiness.



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Appendices

Appendix A: Acronym List

Appendix B: Common Terminology

Appendix C: List of References



Appendix A: Acronyms

CBRNE: Chemical, Biological, Radiological, Nuclear, and Explosives

EMS: Emergency Medical Services

HVA: Hazard Vulnerability Analysis

JAS: Job Action Sheets

LEPC: Local Emergency Planning Committee

MOA/MOU: Memorandum of Agreement/Memorandum of Understanding

MOU: Memorandum of Understanding

NIOSH: National Institute for Occupational Safety and Health

OSHA: Occupational Safety and Health Administration

PAPR: Powered Air Purifying Respirator

PPE: Personal Protective Equipment

REPC: Regional Emergency Planning Committee



Appendix B: Terminology

First Receiver:

Employees at a hospital engaged in decontamination and treatment of victims who have been contaminated by a hazardous substance(s) during an emergency incident. The incident occurs at a site other than the hospital. These employees are a subset of first responders.

First Responder:

Personnel who have responsibility to initially respond to emergencies. Some examples are firefighters, HAZMAT team members, law enforcement officers, lifeguards, forestry personnel, ambulance attendants, and other public service personnel. In the case of hazardous materials incidents, these personnel typically respond at the site where the incident occurred.

Hospital Decontamination Zone:

This zone includes any areas where the type and quantity of hazardous substance is unknown and where contaminated victims, contaminated equipment, or contaminated waste may be present. It is reasonably anticipated that employees in this zone might have exposure to contaminated victims, their belongings, equipment, or waste. This zone includes, but is not limited to, places where initial triage and/or medical stabilization of possibly contaminated victims occur, pre-decontamination waiting (staging) areas for victims, the actual decontamination area, and the post decontamination victim inspection area. This area will typically end at the emergency department door. In other documents, this zone is sometimes called the “Warm Zone”, “contamination reduction zone”, “yellow zone”, or “limited access zone”.

Hospital Post-Decontamination Zone:

The Hospital Post-decontamination Zone is an area considered uncontaminated. Equipment and personnel are not expected to become contaminated in this area. At a hospital receiving contaminated victims, the Hospital Post-decontamination Zone includes the emergency department (unless contaminated). This zone is sometimes called the “Cold Zone” or “Clean Area”.

Common terminology taken from OSHA Best Practices for Hospital-based First Receivers, Appendix B.





Appendix C: List of References

- AELE Law Enforcement. (2011). *Quinn v. St. Louis County*, #10-3332, 653 F.3d 745 (8th Cir. 2011). Retrieved from <http://www.aele.org/law/2011all12/FP2011DEC.html#MONTHLY CASE DIGEST>
- Agency for Healthcare Research and Quality. (October 2005). Decontamination of Children. Retrieved from <http://www.remm.nlm.gov/deconvideo.htm>
- Agency for Healthcare Research and Quality. (n.d.). Public Health Emergency Preparedness: Chapter 3. Decontamination. Retrieved from <http://archive.ahrq.gov/research/devmodels/devmodel3.htm>
- American Society for the Prevention of Cruelty to Animals. (2013). Retrieved from <http://www.asPCA.org/>
- Blazer, J., Murphy, B. (October 28, 2008). National Immigration Law Center. Addressing the needs of immigrants and limited English communities in disaster planning and relief. Retrieved from http://v2011.nilc.org/disaster_assistance/disaster-planning-relief-2008-10-28.pdf
- Braue, E.H., Boardman, C.H., & Hurst, C.G. (n.d.). Decontamination of chemical casualties. Retrieved from http://www.bordeninstitute.army.mil/published_volumes/chemwarfare/Chem-ch16_pg527-558.pdf
- Bulson, J.(n.d.) Hospital based special needs patient decontamination: Lessons from the shower. Retrieved from http://www.ehcca.com/presentations/emsummit5/bulson_ms3.pdf
- California Emergency Medical Services Authority. (July 2005). Patient decontamination recommendations for hospitals. Retrieved from <http://www.emsa.ca.gov/pubs/pdf/emsa233.pdf>
- California Emergency Medical Services Authority. (June 2003). Recommendations for hospitals addressing water containment and run off during decontamination operations. Retrieved from <http://www.calhospitalprepare.org/post/recommendations- hospitals- water-containment-and-run-during-decon-operations>
- Capitol Region Metropolitan Medical Response System. (January 2003). Rapid access mass decontamination protocol. Retrieved from http://www.au.af.mil/au/awc/awcgate/mmrs/mass_decon.pdf
- Carolina Fire Rescue EMS Journal. (October 14, 2011). HAZMAT: Decontamination-cleaning up, Some new, some old techniques. Retrieved from <http://www.carolinafirejournal.com/articles/article-detail/articleid/1759/hazmat-decontamination-cleaningup.aspx>
- Carter, H., Drury, J., Rubin, G.J., Williams, R., Amlot,R. (2013). Communication during mass casualty decontamination: Highlighting the gaps. *International Journal of Emergency Services*. 2 (1). pp. 29-48.



- Carter, H., Drury, J., Rubin, G., James, Williams, R., Amlot, R. (2012). Public experiences of mass casualty decontamination. *Biosecurity and Bioterrorism: Biodefense Strategy, Practice and Science*. Vol. 10, No. 3
- Center for Excellence in Emergency Preparedness. (2009). CBRNE plan checklist. Retrieved from <http://www.ceep.ca/publications/tools/cbrneplanchecklist.pdf>
- Chemical Transportation Emergency Center. (n.d.). Retrieved from <http://www.chemtrec.com/>
- Chicago Healthcare System Coalition for Planning and Response. (June 21, 2012). Special considerations for hospital decontamination. Retrieved from <http://www.ipha.com/Documents/EventAttachments/07172012024937-Special%20Consideration%20for%20Hospital%20Decontamination.pdf>
- Committee for Disaster Medicine Studies. (September 2007). The terror attacks in Madrid, Spain, 2004. Retrieved from http://www.dhs.vic.gov.au/_data/assets/pdf_file/0004/613777/decon_guidance_for_hospitals.pdf
- Continuum Health Partners Center for Bioterrorism Preparedness and Planning. (Draft August 2006). Hospital decontamination of exposed casualties policy and procedure. Retrieved from <http://www.nyc.gov/html/doh/downloads/pdf/bhpp/bhpp-focus-hosp-chpprot-decon.pdf>
- Cosgrove, S.E., Jenckes, M.W., Wilson, L.M., Bass, E.B, & Hsu, E.B. (June 2008). Agency for Healthcare Research and Quality. Tool for evaluating core elements of hospital disaster drills. Retrieved from <http://archive.ahrq.gov/prep/drillelements/>
- Dinsmore, M. Hospital medical decon: mitigating the mandates. Susan B. Allen Memorial Hospital. Powerpoint. (n.d.) Retrieved from http://www.kansastag.gov/AdvHTML_doc_upload/5.%20Medical%20Decontamination--Mitigating%20the%20Mandates.pdf
- Emergency Medicine Society of South Africa. Major incident management system: priorities, communications, and triage. (August, 2008). Retrieved from <http://emssa.org.za/documents/em003.pdf>
- EnMagine, Inc. (2013). Hazmat for Healthcare. Retrieved from <http://www.enmagine.com/index.cfm?Section=1>
- Fitzgerald, D.J., Sztajnkrzyer, M.D, Crocco, T.J. (2003). Chemical weapon functional exercise: Cincinnati: Observations and lessons learned from a “typical medium-sized” city’s response to simulated terrorism utilizing weapons of mass destruction. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/12766215>
- Florida Division of Emergency Management. (n.d.). Module 4, Unit 1: Decontamination instructor guide. Retrieved from <http://www.floridadisaster.org/hazmat/serc/Hazaware/IG%20Mod%204%20U1.pdf>
- Freyberg CW, Arquilla B, Fertel BS, Tunik MG, Cooper A, Heon D, Kohlhoff SA, Ura-neck KI, Foltin GL: Disaster preparedness: Hospital decontamination and the pediatric patient—Guidelines for hospitals and emergency planners. *Prehospital Disaster Medicine* 2008;23(2):166–172. Retrieved from <http://www2.wpro.who.int/internet/files/eha/toolkit/web/Technical%20References/Hospitals%20and%20Health%20Facilities/Disaster%20Preparedness%20Hospital%20Decontamination.pdf>



- Gordon, L.E. (2008). Basic canine service animal decontamination procedures for hospitals. Retrieved from https://www.cseppportal.net/CSEPP_Portal_Resources/BasicCanineDeconHospital.pdf
- Health Protection Agency. (2009). Optimisation through research of chemical incident decontamination systems. Retrieved from: <http://www.orchidsproject.eu/project.html>
- Hick et al. (n.d.) Establishing and training healthcare facility decontamination teams. Retrieved from <http://www.health.state.mn.us/oep/healthcare/deconteam.pdf>
- Institute of Medicine. (1999). Chemical and biological terrorism: Research and development to improve civilian medical response. Retrieved from http://www.nap.edu/openbook.php?record_id=6364&page=100
- International Association for Healthcare Security and Safety. (2012). Healthcare professional safety certificate program. Retrieved from <https://www.iahss.org/>
- Jimenez, E.J., Poalillo, F.E. P. (n.d.). Personal protective equipment and decontamination management strategies. Retrieved from <http://www.sccm.org/sitecollectiondocuments/15%20fdm%20ch15%20draft3.pdf>
- Koenig, K.L., Boatright, C.J., Hancock, J.A. et al. (2008). Health care facility-based decontamination of victims exposed to chemical, biological, and radiological materials. *The American Journal of Emergency Medicine*, v.26. Retrieved from <http://www.sciencedirect.com/science/article/pii/S0735675707004287>
- Koenig, K.L. (2003). Strip and shower: The duck and cover for the 21st century. *Annals of Emergency Medicine*, Vol. 42: 391-394. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/12944892>
- Massachusetts Hospital Association. (October 3, 2002). Hospital draft checklist for decontamination units. Retrieved from <http://www.mhalink.org/Content/ContentFolders/HealthcareIssues2/HospitalPreparedness/HospitalPreparednessAdvisories/2002/PREPAREDNESS4.pdf>
- Massachusetts Department of Public Health. (2012). Hazardous materials tabletop exercise series. After action report and improvement plan.
- Migration Policy Institute. (December 2011). Limited English proficient individuals in the United States: Number, share, growth, and linguistic diversity.
- National Institute for Occupational Safety and Health. (n.d.). NIOSH-Approved particulate filtering facepiece respirators. Retrieved from http://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/
- New York Centers for Terrorism Preparedness and Planning. (April 2006). Protocol for the decontamination of the pediatric patient administrative policy and procedure; and Protocol for decon of chronically disabled victims with prosthetic devices, assistive devices or on mechanical ventilators; and Protocol for the decontamination of persons appearing to suffer from an acute



behavioral disturbance or mental disorder. Retrieved from <http://www.nyc.gov/html/doh/downloads/pdf/bhpp/bhpp-focus-hosp-nyctpprot-decon.pdf>

Occupational Safety and Health Administration. (January 2005). OSHA best practices for hospital- based first receivers of victims from mass casualty incidents involving the release of hazardous substances. Retrieved from http://www.osha.gov/dts/osta/bestpractices/html/hospital_firstreceivers.html

Oklahoma Veterinary Medical Association, Oklahoma Task Force 1- Urban Search and Rescue. (March 12, 2008). Basic canine service animal decontamination procedures for hospitals. Retrieved from https://www.cseppportal.net/CSEPP_Portal_Resources/BasicCanineDeconHospital.pdf

Okumura, S., Okumura, T., Ishimatsu, S. et al. (February 17, 2005). Clinical review: Tokyo – protecting the health care worker during a chemical mass casualty event: an important issue of continuing relevance. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/16137390>

Okumura, T., Suzuki, K., Fukuda, A. et al. (June 1998). The Tokyo subway sarin attack: disaster management, Part 2: hospital response. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/9660290>

Pangi, R. (2002). Consequence management in the 1995 sarin attacks on the Japanese subway system. *Studies in Conflict & Terrorism*, Vol 25: 421-448. Retrieved from <http://www.tandfonline.com/doi/abs/10.1080/10576100290101296#preview>

Penn, P. Hospital hazardous materials emergency response: the devil is in the details. Environmental Hazards Management Institute. PowerPoint. April 14, 2002. Retrieved from <http://www.enmagazine.com/index.cfm?Section=1>

Pilch, F. (n.d.). The worried well: strategies for installation commanders. Retrieved from <http://www.usafa.edu/df/inss/OCP/OCP53.pdf>

Pye, S. (n.d.) Mass Casualty Decontamination for Hospitals: Instructor’s Guide. Retrieved from <http://ems.dhs.lacounty.gov/Disaster/LAInstructorGuideFINAL.pdf>

Ramesh, A.C. & Kumar, S. (July-September 2010). Triage, monitoring, and treatment of mass casualty events involving chemical, biological, radiological, or nuclear agents. *The Journal of Pharmacy and Bioallied Sciences*. Vol.2(3). Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3148628/?tool=pubmed>

St. Vincent Healthcare, Mansfield Health Education Center. Hazmat awareness for first receivers. Powerpoint. March 2012. Retrieved from <http://www.docslide.com/hazmat-awareness-for-first-receivers/>

Saint Barnabas Health Care System. (n.d.). Hospital Decon Operations. Retrieved from <http://www.nj-ptc.org/training/materials/SBHCS/HospitalDeconOp.pdf>

Stone, F.P. (2007). The “Worried Well” Response to CBRN Events: Analysis and Solutions. Retrieved from <http://www.fas.org/irp/threat/cbw/worried.pdf>



- Taylor, K.M., Balfanz-Vertiz, K., Humrickhouse, R., Jurik, C. Decontamination with at-risk populations: lessons learned. *The Internet Journal of Rescue and Disaster Medicine*. (2009). Volume 9, No.1. Retrieved from: <http://www.ispub.com/journal/the-internet-journal-of-rescue-and-disaster-medicine/volume-9-number-1/decontamination-with-at-risk-populations-lessons-learned.html#sthash.xlu6NVmX.dpbs>
- U.S. Army Chemical Biological, Radiological and Nuclear School and U.S. Army Edgewood Chemical /Biological Center. (November 2008). Guidelines for mass casualty decontamination during a HAZMAT/Weapon of mass destruction incident, Volume II. Retrieved from <http://hps.org/hsc/documents/MassCasualtyDeconGuideUpdateVol2.pdf>
- U.S. Army Soldier and Biological Chemical Command (SBCCOM). (January 2000). Guidelines for mass casualty decontamination during a terrorist chemical agent incident. Retrieved from http://www.au.af.mil/au/awc/awcgate/army/sbccom_decon.pdf
- U.S. Centers for Disease Control and Prevention. National Institute for Occupational Safety and Health. (September 2011). NIOSH-approved particulate filtering facepiece respirators. Retrieved from http://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/
- U.S. Census. (2007). Retrieved from <http://www.census.gov/>
- U.S. Department of Energy, Hanford Site. (June 1, 2012). Emergency shower, eyewash, and decontamination facility operation standard. Retrieved from http://www.hanford.gov/tocpmm/files.cfm/PMM_ESHQ-5-STD-19.pdf
- U.S. Department of Energy Office of Transportation and Emergency Management. (October 1, 2003). TEPP planning products model procedure for radioactive material or multiple hazardous materials decontamination. Retrieved from http://www.em.doe.gov/PDFs/transPDFs/Decon_Procedure.pdf
- U.S. Department of Homeland Security and the U.S. Department of Health and Human Services. (2012). Patient decontamination in a mass chemical exposure incident: National planning guidance for communities.
- U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. (2001). (Volume II). Managing hazardous materials incidents, hospital emergency departments: A planning guide for the management of contaminated patients. Retrieved from <http://www.atsdr.cdc.gov/mhmi/index.asp>
- Victorian Government, Emergency Management Branch. (April 2007). Decontamination guidance for hospitals. Retrieved from http://www.dhs.vic.gov.au/_data/assets/pdf_file/0004/613777/decon_guidance_for_hospitals.pdf
- Vogt, B.M. and Sorensen, J.H. (October 2002). How clean is safe? Improving the effectiveness of decontamination of structures and people following chemical and biological incidents. Retrieved from http://emc.ornl.gov/publications/PDF/How_Clean_is_Safe.pdf
- Wetter et al. (May 2001). Hospital Preparedness for Victims of chemical or biological terrorism. *American Journal of Public Health*, Vol. 91, No. 5. Retrieved from <http://ajph.aphapublications.org/doi/pdf/10.2105/AJPH.91.5.710>



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