



TRACIE

HEALTHCARE EMERGENCY PREPAREDNESS
INFORMATION GATEWAY

Pre-Hospital Decontamination
Topic Collection
10/14/2015

Topic Collection: Pre-Hospital Decontamination

Caring for patients on the scene of an incident who have been contaminated by a hazardous material calls for strict planning to protect both the patient and the responder. The resources in this Topic Collection include guidelines, courses, exercises, and lessons learned from past events that can help emergency healthcare providers better plan for, and respond to, hazardous materials incidents. In addition to these resources, providers are encouraged to contact local poison control centers during an event for real-time access to expertise and additional databases and information sources than are available in the field.

Each resource in this Topic Collection is placed into one or more of the following categories (click on the category name to be taken directly to that set of resources). Resources marked with an asterisk (*) appear in more than one category.

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[Pediatric Considerations](#)

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[Agencies and Organizations](#)

Must Reads

Centers for Disease Control and Prevention. (2014). [Radiological Terrorism A Tool Kit for Emergency Services Clinicians](#).

This toolkit contains resources on decontamination, injuries associated with radiation, and handling mass casualties in the aftermath of a radiological terrorist attack.

Chemical Hazard Emergency Medical Management. (2014). [Chemical Decontamination Procedures](#). U.S. Department of Health and Human Services.

This webpage includes procedural information on decontaminating survivors of a mass casualty event before they report for medical care. It includes guidance on setting up decontamination corridors, safe areas, and medical triage areas and includes prehospital and emergency department medical guidance for specific chemical exposures.

Cibulsky, S., Kirk, M., Ignacio, J., et al. (2014). [Patient Decontamination in a Mass Chemical Exposure Incident: National Planning Guidance for Communities](#). U.S. Department of Health and Human Services, Office of the Assistant Secretary for Preparedness and Response.

This guidance can help emergency planners prepare for mass patient decontamination from initial assessment to evaluation of process effectiveness. The authors emphasize the importance of communication and coordination between on-scene and health care facility-based staff.

Cook, L. (2010). [Teaching Hazmat Decontamination](#). Journal of Emergency Medical Services.

The author discusses contamination, the different types of decontamination typically performed on an incident scene, and special challenges that might arise (e.g., patient refusal of decontamination) and how to manage them.

Office of Environmental Management. (2014). [Pre-hospital Practices for Handling a Radiologically Contaminated Patient](#). U.S Department of Energy.

The speakers share medical practices for caring for a managing patients potentially contaminated with radioactive material. Information on personal protective equipment, triage, patient transport, and other related issues is also included.

Okumura, T., Suzuki, K., Fukuda, A., et al. (1998). [The Tokyo Subway Sarin Attack: Disaster Management, Part 1: Community Emergency Response](#). Academic Emergency Medicine. 5(6):613-7.

The authors summarize the emergency medical services response to the attack, including challenges and strengths. They recommend that responders have access to mobile decontamination facilities in similar events. Chemical effects on responders were significant. Though many effects were psychogenic in nature, the mere perception of harm rendered responders less effective (another reason why responder access to personal protective equipment for chemical events is so important).

Transportation Emergency Preparedness Program. (2014). [Pre-Hospital Practices for Handling a Radiologically Contaminated Patient](#). U.S. Department of Energy.

This video highlights personal protective needs for responder safety; illustrates proper patient management, including transport; and shares strategies for returning responders and equipment to use after transporting a patient exposed to a radiological contamination hazard.

U.S. Department of Health and Human Services. (2005). [Decontamination of Children](#).

This video explains how children differ from adults physically and emotionally, and provides recommendations for pediatric decontamination.

Books Available for Purchase

Beebe, R. (2012). Chapter 26: Hazardous Materials Operations. (Book available for purchase.) Professional Paramedic Vol. III Trauma Care and EMS Operations

This chapter provides a general overview of emergency medical response principles and practices for decontaminating patients on the scene of a hazardous materials incident.

Blackwell, T., Brenna, K., DeAtley, C., and Yee, A. (2015). Medical Support for Hazardous Materials Response. (Book available for purchase.) Emergency Medical Services: Clinical Practice and Systems Oversight, 2 Volume Set.

The authors review hazardous materials response planning through all aspects of response, including decontamination and medical monitoring of response personnel.

Bledsoe, B., Porter, R., and Cherry, R. (2005). Chapter 11. Hazardous Materials Incidents. (Book available for purchase.) Paramedic Care Principles and Practices - Special Operations Considerations 2nd Edition.

This chapter provides a comprehensive overview of all aspects of hazardous material response from an emergency medical services, prehospital perspective.

Limmer, D., O'Keefe, M., and Dickinson, E.T. (2011). Chapter 39: Hazardous Materials, Multiple Casualty Incidents and Incident Management. (Book available for purchase.) Emergency Care, 12th Edition.

The authors of the chapter provide introductory information on hazardous material response (including decontamination) for emergency medical technicians.

Education and Training

*Ansari, A., and Caspary, K. (2015). [Guide to Operating Public Shelters in a Radiation Emergency](#). Centers for Disease Control and Prevention, National Center for Environmental Health.

Chapter Three of this guidance document shares strategies for screening and decontamination (of people, service animals, pets, possessions, and vehicles) in shelters. Quick guides on decontamination are provided as appendices.

Center for Domestic Preparedness. (n.d.). [Emergency Medical Operations for CBRNE Incidents](#). (Accessed 9/25/2015.) Federal Emergency Management Agency.

This course provides emergency medical personnel with hands-on training in Chemical, Biological, Radiological, Nuclear and Explosives incident management, field treatment of victims exposed to chemical hazards, biological agents, radiological hazards and explosions. The course concludes with a multi-task, pre-hospital exercise.

Center for Domestic Preparedness. (n.d.). [Framework for Healthcare Emergency Management](#). (Accessed 9/25/2015.) Federal Emergency Management Agency.

Emergency healthcare providers and planners can learn about development, implementation, maintenance, and administration of emergency management programs and plans for healthcare facilities. The course includes lectures and guided discussions on topics such as emergency management issues for healthcare, personal protective equipment, decontamination, and isolation and quarantine.

Center for Domestic Preparedness. (n.d.). [Hands on Training for CBRNE Incidents](#). (Accessed 9/25/2015.) Federal Emergency Management Agency.

This training is focused on personal protective equipment, survey and monitoring equipment, evidence collection and preservation, mass-casualty triage, and explosive devices/searches. It culminates in an in-person training exercise.

Center for Domestic Preparedness. (n.d.). [Hazardous Materials Technician for CBRNE Incidents](#). (Accessed 9/25/2015.) Federal Emergency Management Agency.

This course provides responders with operations- and technician-level knowledge, skills, and abilities in the critical response requirements necessary to conduct sampling and monitoring for Chemical, Biological, Radiological, Nuclear and Explosives hazards and incidents. Includes an in-person 8-hour sampling and monitoring exercise.

Center for Domestic Preparedness. (n.d.). [Hospital Emergency Response Training for Mass Casualty Incidents](#). (Accessed 9/25/2015.) Federal Emergency Management Agency.

This course prepares healthcare personnel (emergency and hospital-based) to conduct a safe and effective emergency medical response to a mass-casualty incident. Participants will learn how to recognize the procedures for ambulatory and nonambulatory decontamination and select and use appropriate levels of personal protective equipment, among other skills.

Center for Domestic Preparedness. (n.d.). [Technical Emergency Response Training for CBRNE Incidents](#). (Accessed 9/25/2015.) Federal Emergency Management Agency.

In this training, responders will learn about potential terrorist targets and chemical, biological, radiological, and explosive hazards that may be used in all emergency incidents. The training includes hands-on exercises in decontamination, mass-casualty triage, and survey and monitoring.

Chemical Stockpile Emergency Preparedness Program. (n.d.). [Emergency Planners' Training](#). (Accessed 8/18/2015.)

These courses provide a variety of hazardous materials training for emergency planners, shelter operators, and animal care professionals. Courses include: "Comprehensive

Planning for Technological Emergencies," "Emergency Planning for People with Access and Functional Needs," and "Animals in Emergencies (for Planners)."

Chemical Stockpile Emergency Preparedness Program. (n.d.). [First Responders' Training](#). (Accessed 8/18/2015.)

These courses provide a variety of hazardous materials training for responders, planners, public officials, and healthcare workers. Courses include: "Comprehensive Planning for Technological Emergencies," "Operations Level Training—A Refresher for Responders," and "Exposure and Contamination."

Cook, L. (2010). [Teaching Hazmat Decontamination](#). Journal of Emergency Medical Services.

The author discusses contamination, the different types of decontamination typically performed on an incident scene, and special challenges that might arise (e.g., patient refusal of decontamination) and how to manage them.

EnMagine, Inc. (2015). [Hazardous Materials](#).

EnMagine provides hospital hazardous materials training. While ASPR TRACIE does not endorse specific vendors, the resources available for public download on the website (including slide decks from trainings) may be valuable to healthcare emergency planners and others responsible for preparing their own curricula/training.

Flaherty, S., Roszak, A., and Klaes, G. (2015). [Radiological Legal Preparedness: Considerations, Research, and Lessons Learned](#). Robert Wood Johnson Foundation, Network for Public Health Law.

The speakers in this webinar provide an overview of a Radiological Emergency Preparedness (REP) program and related protective action guidelines. They discuss state authorities regarding decontamination and restricting the movement of individuals potentially or actually contaminated with radiation.

*Oak Ridge Institute for Science and Education. (2015). [Radiation Emergency Assistance Center/Training Site](#).

This webpage links to the Radiation Emergency Assistance Center/Training Site (REAC/TS), which offers several resources to prepare medical professionals to respond to radiological emergencies. There are links to books, live training courses, online trainings, and assessment and treatment guidance documents. REAC/TS staff are available for deployment to provide medical consultation during emergencies, upon request.

Office of Environmental Management. (2014). [Pre-hospital Practices for Handling a Radiologically Contaminated Patient](#). U.S Department of Energy.

The speakers share medical practices for caring for a managing patients potentially contaminated with radioactive material. Information on personal protective equipment, triage, patient transport, and other related issues is also included.

*Tennessee Emergency Medical Services for Children. (2012). [Responding to Chemical Incidents](#).

This course teaches responders how to recognize signs and symptoms of pediatric contamination by chemical agent. It also shares information on pediatric decontamination procedures.

Transportation Emergency Preparedness Program. (2014). [Pre-Hospital Practices for Handling a Radiologically Contaminated Patient](#). U.S. Department of Energy.

This video highlights personal protective needs for responder safety; illustrates proper patient management, including transport; and shares strategies for returning responders and equipment to use after transporting a patient exposed to a radiological contamination hazard.

*U.S. Department of Health and Human Services. (2005). [Decontamination of Children](#).

This video explains how children differ from adults physically and emotionally, and provides recommendations for pediatric decontamination.

U.S. Department of Health and Human Services. (n.d.). [Radiation and Emergency Medical Management](#). (Accessed 9/14/2015.)

This webpage provides guidance on diagnosis and treatment for healthcare providers. It includes downloadable tools, templates, references, and contact lists.

Event-Specific Lessons Learned

Egan, J., and Amlot, R. (2012). [Modelling Mass Casualty Decontamination Systems Informed by Field Exercise Data](#). International Journal of Environmental Research and Public Health. 9(10):3685-710.

The authors reviewed field exercise data collected during a mass decontamination exercise. They found that the "bottleneck" in the process was the re-dressing or re-robing of patients after they had showered. They suggested strategies for addressing this challenge, including shorter showers and more people showering at one time. ASPR TRACIE subject matter expert reviewers suggest, however, that shorter showers may be less effective, and recommend additional space for re-dressing. This article does effectively convey that "real-world" decontamination will experience bottlenecks—some of which can be anticipated and some of which will require adaptation during the event. Availability of "dry decontamination" / redress kits for those with minimal/no symptoms may help prevent bottlenecks in the gross/technical decontamination process.

Morimura, N., Asari, Y., Yamaguchi, Y., et al. (2013). [Emergency/Disaster Medical Support in the Restoration Project for the Fukushima Nuclear Power Plant Accident](#). *Emergency Medical Journal*. 30: 997-1002.

The authors describe the medical response to the incident, including patient decontamination. Photos of the decontamination tent and tables illustrating diagnosis and patient outcome are included.

Okumura, T., Suzuki, K., Fukuda, A., et al. (1998). [The Tokyo Subway Sarin Attack: Disaster Management, Part 1: Community Emergency Response](#). *Academic Emergency Medicine*. 5(6):613-7.

The authors summarize the emergency medical services response to the attack, including challenges and strengths. They recommend that responders have access to mobile decontamination facilities in similar events. Chemical effects on responders were significant. Though many effects were psychogenic in nature, the mere perception of harm rendered responders less effective (another reason why responder access to personal protective equipment for chemical events is so important).

Guidance

Agency for Toxic Substances & Disease Registry. (2013). [Managing Hazardous Materials Incidents \(MHMIs\)](#). Centers for Disease Control and Prevention.

This three-volume guide and companion videos for the management of chemically contaminated patients is available in print, HTML, PDF and CD-ROM formats.

Agency for Toxic Substances & Disease Registry. (2014). [ToxFAQs™](#). Centers for Disease Control and Prevention.

This webpage contains links to two-page summaries of the most commonly asked questions about specific chemicals.

Agency for Toxic Substances & Disease Registry. (2015). [Toxicological Profiles](#). Centers for Disease Control and Prevention.

This series of 150 peer-reviewed publications details the known adverse health effects of specific chemicals and includes public health talking points on the harmful potential and properties of each, as well as more technical information. ToxFAQs links are also provided when available.

Chemical Hazard Emergency Medical Management. (2014). [Chemical Decontamination Procedures](#). U.S. Department of Health and Human Services.

This webpage includes procedural information on decontaminating survivors of a mass casualty event before they report for medical care. It includes guidance on setting up

decontamination corridors, safe areas, and medical triage areas and includes prehospital and emergency department medical guidance for specific chemical exposures.

Cibulsky, S., Kirk, M., Ignacio, J., et al. (2014). [Patient Decontamination in a Mass Chemical Exposure Incident: National Planning Guidance for Communities](#). U.S. Department of Health and Human Services, Office of the Assistant Secretary for Preparedness and Response.

This guidance can help emergency planners prepare for mass patient decontamination from initial assessment to evaluation of process effectiveness. The authors emphasize the importance of communication and coordination between on-scene and health care facility-based staff.

Department of Defense, U.S. Army Edgewood Chemical Biological Center. (2013). [Guidelines for Mass Casualty Decontamination During a HAZMAT/Weapon of Mass Destruction Incident, Volumes I and II](#).

These guidelines can be tailored by first responders and emergency planners responsible for designing mass casualty decontamination plans following a hazardous material or weapons of mass destruction attack.

Fatah, A., Arcilesi, R., Judd, A., et al. (2007). [Guide for the Selection of Chemical, Biological, Radiological, and Nuclear Decontamination Equipment for Emergency First Responders](#). U.S. Department of Homeland Security.

This (very detailed, yet somewhat dated) guidance can help emergency responders learn more about chemical, biological, radiological, and nuclear decontamination equipment. It includes information on delivery systems, containment devices and accessories, shelters, showers, commercial decontaminants (foams, solutions, gaseous, nonaqueous), and decontamination systems and trailers.

Jagminas, L. (2013). [CBRNE-Chemical Decontamination](#). Medscape.

On this webpage, the author defines and shares strategies for recognizing chemical contamination; provides an overview on personal protective equipment (and additional links to resources); information on pre-hospital decontamination; and considerations for evacuating the emergency department.

Kumar, V., Goel, R., Chawla, R., et al. (2010). [Chemical, Biological, Radiological, and Nuclear Decontamination: Recent Trends and Future Perspective](#). Journal of Pharmacy and BioAllied Sciences. 2(3): 220-238.

The authors present the general principles of decontamination with a focus on radiodecontamination.

Monteith, R.G., and Pearce, L.D. (2015). [Self-care Decontamination within a Chemical Exposure Mass-casualty Incident](#). (Abstract only.) *Prehospital & Disaster Medicine*. 30(3):288-96.

The authors stress the need for self-care decontamination procedures that can help avoid delays in decontamination and on-scene treatment. They suggest that first responders instruct patients to perform "MADE:" Move/Assist, Disrobe/Decontaminate, and Evaluate/Evacuate.

National Institute for Occupational Safety and Health. (2015). [NIOSH Pocket Guide to Chemical Hazards](#). Centers for Disease Control and Prevention.

This resource catalogs more than 650 of the most common industrial chemicals and lists them alphabetically along with their key physical property, hazard limits (IDLH, TLV, etc.), and toxic effects in a quick-reference that can be accessed on-line, downloaded, or obtained in print.

*Oak Ridge Institute for Science and Education. (2015). [Radiation Emergency Assistance Center/Training Site](#).

This webpage links to the Radiation Emergency Assistance Center/Training Site (REAC/TS), which offers several resources to prepare medical professionals to respond to radiological emergencies. There are links to books, live training courses, online trainings, and assessment and treatment guidance documents. REAC/TS staff are available for deployment to provide medical consultation during emergencies, upon request.

Occupational Safety and Health Administration. (n.d.) [Frequently Asked Questions: HAZWOPER](#). (Accessed 8/17/2015.) U.S. Department of Labor.

The Hazardous Waste Operations and Emergency Response (HAZWOPER) standard applies to five distinct groups of employers and their employees who may be exposed hazardous substances, including emergency operations planners. This document provides answers to frequently asked questions (e.g., HAZWOPER training, incidental vs. accidental spills).

Occupational Safety and Health Administration. (2005). [OSHA Best Practices for Hospital-Based First Receivers of Victims from Mass Casualty Incidents Involving the Release of Hazardous Substances](#). U.S. Department of Labor.

This Occupational Safety and Health Administration report highlights promising practices that can enhance hospital employee protection and training as part of emergency planning for mass casualty incidents involving hazardous substances. Though geared to hospitals, the document contains a great deal of valuable information about PPE and programs/training of relevance to first responders, particularly those that are not fire-

based and may model their PPE and programs similarly in order to support warm-zone response support when appropriate.

Occupational Safety and Health Administration. (2009). [Best Practices for Protecting EMS Responders during Treatment and Transport of Victims of Hazardous Substance Releases](#). U.S. Department of Labor.

This document contains guidance for the emergency medical response to a hazardous material incident. It includes information on the role of responders in the community, the Occupational Health and Safety Administration's response principles, and practical recommendations and best practices on a variety of topics, including pre-transport patient decontamination.

Occupational Safety and Health Administration. (2013). [Hazardous Waste Operations and Emergency Response \(HAZWOPER\)](#). U.S. Department of Labor.

This document provides emergency planners with the official federal requirements of the HAZWOPER standards (CFR 1910.120) surrounding HAZMAT responses including team training, definitions, and requirements. This resource can help responders interpret regulations and can illustrate the origin of the requirements for those who are not familiar with HAZMAT regulations. States may have additional regulations, and letters of interpretation from OSHA may provide clarification and/or create additional expectations in addition to these regulations.

Science Applications International Corporation. (2005). [Chapter 3: Decontamination](#). Agency for Healthcare Research and Quality (Archived.)

The chapter provides an overview of decontamination and highlights related regulations, best practices, and methods of prehospital decontamination areas and procedures.

*U.S. Department of Transportation, Transport Canada, and Secretariat of Transport and Communications. (2012). [2012 Emergency Response Guidebook: A Guidebook for First Responders During the Initial Phase of a Dangerous Goods/ Hazardous Materials Transportation Incident](#).

This guidebook can help first responders determine the best approach to a hazardous materials transportation incident. It includes steps for reading universal "shipping documents," steps for assessing information on the hazard classification system, graphics and how to interpret them, and material-specific information.

Pediatric Considerations

- *Tennessee Emergency Medical Services for Children. (2012). [Responding to Chemical Incidents](#).

This course teaches responders how to recognize signs and symptoms of pediatric contamination by chemical agent. It also shares information on pediatric decontamination procedures.

- *U.S. Department of Health and Human Services. (2005). [Decontamination of Children](#).

This video explains how children differ from adults physically and emotionally, and provides recommendations for pediatric decontamination.

Plans, Tools, and Templates

- *Ansari, A., and Caspary, K. (2015). [Guide to Operating Public Shelters in a Radiation Emergency](#). Centers for Disease Control and Prevention, National Center for Environmental Health.

Chapter Three of this guidance document shares strategies for screening and decontamination (of people, service animals, pets, possessions, and vehicles) in shelters. Quick guides on decontamination are provided as appendices.

- Centers for Disease Control and Prevention. (2014). [Radiological Terrorism A Tool Kit for Emergency Services Clinicians](#).

This toolkit contains resources on decontamination, injuries associated with radiation, and handling mass casualties in the aftermath of a radiological terrorist attack.

- Science Applications International Corporation. (2005). [Decontamination Shelter](#). Agency for Healthcare Research and Quality (Archived.)

Strategies for activating and using a decontamination shelter are outlined in this document.

- *U.S. Department of Transportation, Transport Canada, and Secretariat of Transport and Communications. (2012). [2012 Emergency Response Guidebook: A Guidebook for First Responders During the Initial Phase of a Dangerous Goods/ Hazardous Materials Transportation Incident](#).

This guidebook can help first responders determine the best approach to a hazardous materials transportation incident. It includes steps for reading universal "shipping documents," steps for assessing information on the hazard classification system, graphics and how to interpret them, and material-specific information.

Agencies and Organizations

Note: The agencies and organizations listed in this section have a page, program, or specific research dedicated to this topic area.

Centers for Disease Control and Prevention, Emergency Preparedness and Response. [Radiation Emergencies](#).

Federal Emergency Management Agency. [Center for Domestic Preparedness](#).

Medscape. [CBRNE-Chemical Decontamination](#).

Texas A&M Engineering Extension Service. (2015). [Various Courses](#).

U.S. Department of Health and Human Services. Chemical Hazards Emergency Medical Management. [Decontamination Procedures](#).

U.S. Department of Health and Human Services, [Radiation and Emergency Medical Management](#).

U.S. Department of Health and Human Services. Radiation Emergency Medical Management. [Decontamination Procedures](#).

*This ASPR TRACIE Topic Collection was comprehensively reviewed in August 2015 by the following subject matter experts (listed in alphabetical order): **Eric Alberts**, BS, FPPEM, CHS-V, CDP-1, CHPP, CHEP, SEM, CFRP, FABCHS; **Craig DeAtley**, PA-C, Director, Institute for Public Health Emergency Readiness, MedStar Washington Hospital Center, and Administrative Director, D.C. Emergency HealthCare Coalition; **Anthony “Tony” Egan**, RN, MSN, Manager, Security and Emergency Training, Network Emergency Management, North Shore-Long Island Jewish Health System; **John Hick**, MD, HHS ASPR and Hennepin County Medical Center; **Mark Jarrett**, MD, MBA, MS, Sr. Vice President and Chief Quality Officer, Associate Chief Medical Officer, North Shore-LIJ Health System and Professor of Medicine, Hofstra – North Shore LIJ School of Medicine; and **Brad Learn**, Regional Healthcare Preparedness Coordinator, Kentucky Department for Public Health.*