Chemical Surge

An Annex of the Healthcare Coalition of Rhode Island Response Plan

As of 16 April 2024

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Promulgation Document

To all Recipients:

Promulgated herewith is the Healthcare Coalition of Rhode Island Response Plan's Chemical Surge Annex. This plan outlines the processes and general strategies of the Coalition to support its members in responding to a situation involving individuals exposed to and/or contaminated by a hazardous chemical.

This plan is not intended to either preclude or supersede any plans maintained by the Coalition's members; rather, it is intended to provide clear guidance to members and stakeholders about the Coalition's response processes, around which they may further develop and refine their respective plans, processes, and activities.

This plan will be reviewed by the Coalition's membership on an annual basis. Lessons learned and best practices that have been identified will be incorporated into a regular update process, coordinated by the Coalitions' Co-Chairs.

Sincerely,

_____

Rupsha Biswas Date
HCRI Co-Chair

_____

Dawn Lewis Date
HCRI Co-Chair

Verification of Plan Approval

The undersigned agree with the following Healthcare Coalition of Rhode Island Response Plan's Chemical Surge Annex:

Hospital Representative Date

Emergency Medical Services Representative Date

Emergency Management Representative Date

Public Health Representative Date

The Co-Chairs of the Healthcare Coalition of Rhode Island and the Coalition's Chemical Surge Clinical Advisor have reviewed and authorized final approval of the Healthcare Coalition of Rhode Island Response Plan's Chemical Surge Annex.

Rupsha Biswas Date
HCRI Co-Chair

Dawn Lewis Date
HCRI Co-Chair

Rachel Wightman, MD Date
HCRI Chemical Emergency Clinical Advisor

Record of Revision

The following revisions have been approved by the Co-Chairs of the Healthcare Coalition of Rhode Island, in concert with all appropriate stakeholders:

Section and Summary of Changes	Date of Revision	Revision Number	Revision Made By

Record of Distribution

The following individuals and agencies have received this version of the Healthcare Coalition of Rhode Island Response Plan's Chemical Surge Annex:

Plan Recipient and Job Title	Agency	Date of Delivery	Copies Delivered

Contents

Introduction

This is an annex of the Healthcare Coalition of Rhode Island (HCRI) Response Plan. For more information on the Coalition and its activities, including those both before and during disasters, please see the HCRI Preparedness Plan and the HCRI Response Plan, respectively.

Purpose and Scope

The purpose of HCRI's Chemical Surge Annex is to outline current capabilities and capacity, expected actions, and other guidance and references to support the ability of the Coalition and its members to effectively respond to a large-scale incident involving a high volume of patients exposed to, contaminated with, and/or injured by chemical substances.

As an annex to HCRI's Response Plan, this document is intended to supplement existing processes and policies implemented within the Coalition – particularly those outlined in the HCRI Response Plan – in support of an all-hazards approach to emergency responses. This document is not intended to supplant or supersede any existing plans maintained by individual HCRI members, the Coalition, or the State of Rhode Island; instead, it has been designed to further reinforce existing mechanisms for response coordination with subject-specific (chemical hazards) considerations and activities.

This plan is focused primarily on the management of medical surge resulting from a chemical emergency. Some chemical emergencies may also have physical effects (e.g., contamination) on critical infrastructure in the State, including healthcare facilities, which could impair their normal operation. Members of HCRI are encouraged to consider such impacts in their own respective emergency planning efforts, particularly business continuity and other continuity of operations plans.

Plan Layout and Organization

HCRI's Chemical Surge Annex comprises the following components:

- **Situation Overview**
  - **Hazard Analysis Summary** – *A general overview of hazardous chemicals*
  - **Exposure and Effects** – *Information related to exposure to hazardous chemicals and resulting effects, including toxidromes.*
  - **Considerations for Rhode Island** – *Characteristics of Rhode Island that may influence the risk of chemical emergencies.*
  - **Healthcare Coalition of Rhode Island** – *A general overview of HCRI, its members and composition, and associated resources*
- **Concept of Operations** – *Considerations to supplement standard HCRI response processes, unique chemical emergency-related actions and responsibilities, and areas of coordination with State, regional, and national response efforts.*
  - **Activation and Notification** – *Triggers for plan activation and HCRI's process for member and partner notifications.*
  - **Roles and Responsibilities** – *HCRI members' roles and responsibilities during a response to a chemical emergency.*
  - **Logistics** – *HCRI's strategies to support members to maximize surge capacity and capability through staff, supplies, and space during a chemical emergency.*
  - **Communications** – *Considerations for both operational communications and public information during chemical emergencies.*

    - **Safety and Control Measures** – *General protective measures related to chemical emergencies, including personal protective equipment, decontamination, and waste management.*
    - **General Medical Care Operations** – *Considerations related to pre-hospital and hospital care of patients during a chemical emergency, including triage, decontamination, transport, and ensuing care.*
    - **Special Considerations** – *Unique considerations related to behavioral health, pediatric patients, and individuals with access and functional needs.*
- **Deactivation and Recovery**
- **Plan Maintenance and Administration**
- **Attachments**

Situation Overview

Hazard Analysis Summary

Hazardous chemicals can be found in every community. They are in almost every home and in most hospitals and factories. Hazardous chemicals are transported every day via land, air, and sea. If released, hazardous chemicals may cause harm to people, the environment, critical infrastructure, and property. Their potential for harm exists regardless of whether hazardous chemicals are released by accident, malicious actor, fire, or weather-related impact.

There is no comprehensive list of hazardous chemicals. As defined by the Occupational Safety and Health Administration (OSHA), hazardous chemicals include any element, compound, or mixture of elements that is a physical hazard (such as flammability, corrosion, and explosibility) or a health hazard (such as irritation, sensitization, and carcinogenicity).

Chemicals, including hazardous chemicals, can be classified or categorized in several ways. One of the most prevalent classification systems is the Globally Harmonized System of Classification and Labeling of Chemicals (GHS), which was developed by the United Nations as a way to bring into agreement the chemical regulations and standards of different countries. GHS includes criteria for the classification of health, physical, and environmental hazards, as well as specifying what information should be included on labels of hazardous chemicals, including safety data sheets.

The Agency for Toxic Substances and Disease Registry (ATSDR) groups chemicals by their structure (e.g., hydrocarbons), uses (e.g., pesticides), radiological properties (e.g., radioactive materials), or other factors. The chemical classes identified below are ones used by ATSDR to categorize hazardous substances:

- Coal ash
- Benzidines/Aromatic amines
- Dioxins, Furans, PCBs
- Halogenated pesticides and related compounds
- Hydrocarbons
- Inorganic substances
- Metals/elements
- Nitrosamines/ethers/alcohols
- Organophosphates and carbamates
- Pesticides

- Phenols/phenoxy acids
- Phthalates
- Radionuclides
- Volatile organic compounds
- Warfare and terrorism agents

ATSDR's collection of toxicological profiles provides compilation of toxicological information on a given hazardous substance. Each peer-reviewed toxicological profile reflects a comprehensive and extensive evaluation, summary, and interpretation of available toxicological and epidemiological information on a substance.

Exposure and Effects

(*adapted from* FEMA's Introduction to Hazardous Materials, Unit 4)

Chemicals and hazardous substances may enter the body by several routes, and the nature and onset of signs and symptoms may vary accordingly. Gases, vapors, and aerosols, when inhaled, may be absorbed through any part of the respiratory tract, from the mucosa of the nose and mouth to the alveoli of the lungs. The conjunctival membrane of the eye may also directly absorb them. Aerosol particles larger than 5 micrometers (μm) tend to be retained in the upper respiratory tract, while those smaller than 1 μm tend to be breathed in and out again, although some of these smaller particles may be retained. Droplets of liquid and, less commonly, solid particles may be absorbed through the surface of the skin and mucous membranes. Toxic compounds with a characteristic action on the skin can produce their effects when deposited on the skin as solid or liquid particles.

Chemicals or hazardous substances that penetrate the skin may form temporary reservoirs so that delayed absorption may occur. Even the vapor of some volatile chemicals and agents can penetrate the intact skin and intoxication may follow. Wounds or abrasions present areas that are more permeable than intact skin. Chemicals and hazardous substances may contaminate food and drink and be absorbed by the gastrointestinal tract. The penetration of chemicals and hazardous substances by these various routes may not be accompanied by irritation or damage to the surfaces concerned.

Routes of Entry

(*Adapted from* University of Nebraska-Lincoln's Toxicology and Exposure Guidelines)

There are four routes by which a substance can enter the body: inhalation, skin (or eye) absorption, ingestion, and injection.

- **Inhalation**: For most chemicals in the form of vapors, gases, mists, or particulates, inhalation is the major route of entry. Once inhaled, chemicals are either exhaled or deposited in the respiratory tract. If deposited, damage can occur through direct contact with tissue or the chemical may diffuse into the blood through the lung-blood interface. Upon contact with tissue in the upper respiratory tract or lungs, chemicals may cause health effects ranging from simple irritation to severe tissue destruction. Substances absorbed into the blood are circulated and distributed to organs that have an affinity for that particular chemical. Health effects can then occur in the organs, which are sensitive to the toxicant.
- **Skin (or eye) absorption**: Skin (dermal) contact can cause effects that are relatively innocuous such as redness or mild dermatitis; more severe effects include destruction of skin tissue or other debilitating conditions. Many chemicals can also cross the skin

barrier and be absorbed into the blood system. Once absorbed, they may produce systemic damage to internal organs. The eyes are particularly sensitive to chemicals. Even a short exposure can cause severe effects to the eyes; also, the substance can be absorbed through the conjunctival membrane and be transported to other parts of the body, causing harmful effects.

- **Ingestion**: Chemicals that inadvertently get into the mouth and are swallowed do not generally harm the gastrointestinal tract itself unless they are irritating or corrosive. Chemicals that are insoluble in the fluids of the gastrointestinal tract (stomach, small, and large intestines) are generally excreted. Others that are soluble are absorbed through the lining of the gastrointestinal tract. They are then transported by the blood to internal organs where they can cause damage.
- **Injection**: Substances may enter the body if the skin is penetrated or punctured by contaminated objects. Effects can then occur as the substance is circulated in the blood and deposited in the target organs.

Once the chemical is absorbed into the body, three other processes are possible: metabolism, storage, and excretion. Many chemicals are metabolized or transformed via chemical reactions in the body. In some cases, chemicals are distributed and stored in specific organs. Storage may reduce metabolism and, therefore, increase the persistence of the chemicals in the body. The various excretory mechanisms (exhaled breath, perspiration, urine, feces, or detoxification) rid the body of the chemical over a period of time. For some chemicals, elimination may be a matter of days or months; for others, the elimination rate is so low that they may persist in the body for a lifetime and cause deleterious effects.

Toxicity

Toxicity describes the degree to which a substance is poisonous or can cause injury. Toxicity depends on a variety of factors:

- Substance's intrinsic toxicity
- Substance's pH
- Substance's physical state
    - Substance's particle size
- Dose
    - The dose is the amount of substance that enters a body
        - Dose is often measured as a fraction of milligrams (or micrograms) per bodyweight
- Duration
    - Time (duration) that someone is exposed to a substance is often given as a dose per day (e.g., amount/weight, per measure of time)
        - An acute exposure is short-term (e.g., 24 hours or less)
        - A chronic exposure is long-term (e.g., weeks, months)
- Route of entry
- Shape and structure of the substance itself (the three-dimensional shape of a molecule)
- Individual human factors, such as differences in health status, sex, and genetics

Toxidromes

When in a medical and public health context, it can be helpful to categorize hazardous chemicals based on their associated toxidromes. A toxidrome, or toxic syndrome, is a constellation of toxic effects comprising a set of clinical fingerprints for a group of chemicals. Toxidrome recognition is important **because it provides a tool for rapid**

detection of the suspected cause and can focus the differential diagnosis to the consideration of only a few chemicals with similar toxic effects.

The following is a list of common toxidromes observed in mass chemical exposures, like accidental spills:

- Acute exposure to solvents, anesthetics, or sedatives (SAS) Toxidrome
  - Central nervous system depression leading to a decreased level of consciousness (progressing to coma in some cases), depressed respirations, and in some cases ataxia (difficulty balancing and walking).
  - *Examples*: Benzene, gasoline, toluene
- Anticholinergic Toxidrome
  - Under-stimulation of cholinergic receptors leading to dilated pupils (mydriasis), decreased sweating, urinary retention, fast heart rate (tachycardia), elevated temperature, and mental status changes, including characteristic hallucinations.
  - *Examples*: BZ
- Anticoagulants Toxidrome
  - Alteration of blood coagulation that results in abnormal bleeding indicated by excessive bruising, and bleeding from mucous membranes, the stomach, intestines, urinary bladder, and wounds, as well as other internal (e.g., intracranial, retroperitoneal) bleeding.
  - *Examples*: Super warfarin (e.g., brodifacoum)
- Cholinergic Toxidrome (also called Pesticide or Nerve Agent Syndrome)
  - Over-stimulation of cholinergic receptors leading to first activation, and then fatigue of target organs, leading to pinpoint pupils (miosis), slow heart rate (bradycardia), bronchospasm (wheezing), and excessive output from all secretory cells/organs ("leaking all over" – bronchial secretions, sweat, tears, saliva, vomiting, incontinence). Seizures, muscle twitching, weakness, and eventual paralysis can occur. Bradycardia and miosis (small pupils) are most commonly seen, however, at times, mydriasis and tachycardia may be observed as sympathetic ganglia also contain nicotinic receptors.
  - *Examples*: Organophosphate insecticides, nerve agents (e.g., VX, sarin, tabun)
- Convulsant Toxidrome
  - Central nervous system excitation (GABA antagonism and/or glutamate agonism and/or glycine antagonism) leading to generalized convulsions.
  - *Examples*: Strychnine, hydrazine
- Irritant/Corrosive Toxidrome
  - Immediate effects range from minor irritation of exposed skin, mucous membranes, pulmonary, and gastrointestinal (GI) tract to coughing, wheezing, respiratory distress and more severe GI symptoms that may progress rapidly to systemic toxicity.
  - *Examples*: Hydrochloric acid, ammonia, chlorine
- Knockdown Toxidrome
  - Disrupted cellular oxygen delivery to tissues may be caused by simple asphyxia due to oxygen displacement by inert gases, hemoglobinopathies (e.g., carbon monoxide, methemoglobin inducers) impairing oxygen transport by the red blood cell, and/or impairment of the cell's ability to use oxygen (e.g., mitochondrial inhibitors such as cyanide). All these situations lead to altered states of consciousness, progressing from fatigue and lightheadedness to seizures and/or coma, with cardiac signs and symptoms, including the possibility of cardiac arrest.
  - *Examples*: Hydrogen cyanide, arsine, nitrites

- Opioid Toxidrome
    - Opioid agonism leading to pinpoint pupils (miosis), and central nervous system and respiratory depression.
    - *Examples*: Fentanyl
- Stress-Response/Sympathomimetic Toxidrome
    - Stress- or toxicant-induced catecholamine excess or central nervous system excitation leading to confusion, panic, and increased pulse, respiration, and blood pressure.
    - *Examples*: Mephedrone (bath salts), cocaine, MDMA

Considerations for Rhode Island

From the State of Rhode Island's Hazard Mitigation Plan (2023),

> Numerous facilities in Rhode Island store, use, dispose, or have the capacity and infrastructure to handle hazardous materials on a regular basis. Under Title III of the Emergency Planning and Community Right to Know Act, facilities that meet certain requirements must report to federal, state, and local authorities. These facilities are commonly referred to as "Tier I" or "Tier II" facilities. There are 724 Tier II facilities located in Rhode Island.
>
> Counties with multiple chemical facilities, such as Providence [County], experience a greater risk of a chemical incident than other locations. However, almost every community in Rhode Island has at least one facility that stores, produces, or utilizes a hazardous material. Propane installations are located across the State and their presence increases the risk of an incident. Hundreds of thousands of hazardous materials shipments move through Rhode Island annually. These shipments can occur at any time, day or night, and by means of road, rail, air, and water, and often through areas with urbanized, high-volume traffic routes.
>
> Rhode Island's densely populated cities can often force people to live in closer proximity to major travel routes and zoned chemical manufacturing sites where chemical incidents have a higher probability of occurrence. Generally, these incidents occur due to a transportation accident or a malfunction during the manufacturing of chemicals which results in an unintended release. The resulting effect on people, including injury and death, is contingent on the type, amount, and environment in which the incident occurred. Generally, the release of hazardous materials poses the greatest risk to those in the immediate vicinity, although runoff of hazardous materials into drinking water sources and supplies may create an indirect impact on the public outside of the immediately impacted area.
>
> The United States Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) is a federal agency responsible for regulating the safe and secure transportation of hazardous materials by all modes of transportation, including pipelines, trucks, trains, ships, and aircraft. For the five-year period from 2018 to 2023, PHMSA has reported 275 hazardous materials incidents in Rhode Island. Of these incidents, four were considered as a serious bulk release, and one required a serious evacuation. No fatalities or injuries were reported, and no radiological incidents were reported.
>
> Data from the Rhode Island Department of Environmental Management and from PHSMA indicates that the probability of a hazardous material incident during any given year is 100%. However, data indicates that the large majority of these incident will [likely] be small in scale and cause [limited to] no evacuation, injuries, or deaths.

Healthcare Coalition of Rhode Island

HCRI is Rhode Island's single emergency preparedness and response healthcare coalition. It is co-led by the Rhode Island Department of Health's Hospital Preparedness Program Director and the Hospital Association of Rhode Island's Healthcare Emergency Management Director.

Composition

HCRI's membership comprises a range of healthcare, public health, and public safety agencies in Rhode Island. HCRI's Core Members include hospitals, emergency medical services (EMS), public health (RIDOH), and emergency management agencies. Additional members include community health centers, urgent care centers, nursing homes, assisted living communities, end-stage renal disease treatment facilities, home healthcare and hospice agencies, and more.

Rhode Island Partners

HCRI also maintains close connections to fire departments, hazardous materials and decontamination teams, the Rhode Island National Guard's 13th Weapons of Mass Destruction Civil Support Team, and other agencies with first-responder roles in a chemical emergency. They include:

- **Fire department-based hazardous materials teams**. Rhode Island has six fire department-based hazardous materials teams.
    - Cranston
    - East Providence
    - Hope Valley (Hopkinton)
    - Providence
    - Warwick
    - Woonsocket
- **Fire department-based decontamination teams**. Rhode Island has four fire department-based decontamination teams.
    - Hopkins Hill (Coventry)
    - Kingston (South Kingstown)
    - North Kingstown
    - North Providence
- **Rhode Island Department of Environmental Management**. The Department of Environmental Management's (DEM) Office of Emergency Response serves as a state-level hazardous materials team.
- **Rhode Island National Guard 13th Weapons of Mass Destruction Civil Support Team (13th WMD-CST)**. 13th WMD-CST's mission centers on responses to suspected or known weapons of mass destruction incidents that involve chemical, biological, radiological, nuclear, or explosive agents.

The Brown University Alpert Medical School's Department of Emergency Medicine maintains a Division of Disaster Medicine and Emergency Preparedness that may be able to provide HCRI members additional subject-matter expertise during a chemical emergency.

Regional Partners

Through its connection to RIDOH and Emergency Support Function 8, HCRI works to coordinate with preparedness and response partners outside Rhode Island, including neighboring states' departments of public health, healthcare coalitions, and federal response partners assigned to Region 1. In the event of large-scale disaster, HCRI and RIDOH frequently engage with these partners to ensure situational awareness and, when necessary and possible, share resources.

The **Region 1 Regional Disaster Health Response System** (RDHRS) is an initiative funded and supported by ASPR, coordinated and led by Massachusetts General Hospital (Boston, MA). Region 1's RDHRS will work to coordinate the clinical and operational subject-matter expertise of key partners from throughout the New England region, facilitating a system by which this expertise can be rapidly shared to support states responding to disaster. In addition to information sharing, RDHRS may also be engaged to support interstate resource sharing and patient movement, if necessary.

HCRI Capabilities and Capacity

In general, all acute care hospitals in Rhode Island maintain baseline decontamination capabilities.

Acute Care Hospital	Fixed Decontamination?	Decontamination Tent?	On-Site Toxicologist?	Chemical-Hazard PPE?
Kent Hospital	Yes	Yes		Yes
Landmark Medical Center	No	Yes	No	Yes
The Miriam Hospital	Yes	Yes		Yes
Newport Hospital	Yes	Yes		Yes
Our Lady of Fatima Hospital	No	Yes	No	Yes
Providence VA Medical Center	No	Yes		Yes
Rhode Island Hospital (including Hasbro)	Yes	Yes	Yes	Yes
Roger Williams Medical Center	Yes	Yes		Yes
South County Hospital	Yes	Yes		Yes
Westerly Hospital	Yes	Yes		Yes
Women and Infants Hospital	No	Yes		Yes

The primary goals for emergency department personnel in handling a contaminated individual include cessation of patient exposure, patient stabilization, and patient treatment, all without jeopardizing their own safety.

Hospitals can evaluate their planning and preparedness for decontamination operations using the following tool developed by the Harvard School of Public Health and the Massachusetts Department of Public Health: Hospital Decontamination Self-Assessment Tool.

Assumptions

The following assumptions have been made to support the development and operationalization of this annex:

- The Rhode Island Department of Health/HCRI will receive timely notification from local/State emergency management and/or public safety of an incident involving a significant number of people exposed to a potentially hazardous chemical
- A mass casualty incident (MCI) will be declared on scene, and may be accompanied by the activation of the MCI feature of the Patient Tracking System (PTS)
    - If an MCI is not activated in PTS by on-scene responders, HCRI leadership will activate it and notify responders accordingly
- Hospital emergency departments may experience an initial influx of patients from the incident who have self-transported or traveled by means other than EMS; these presentations may occur before HCRI's initial involvement
- Hospitals on diversion at the time of the incident must accept patients transported from the incident, in accordance with the exception to hospital diversions for patients from an MCI, as outlined in the Rhode Island Hospital Diversion Plan
- Region 1's Regional Disaster Health Response System (RDHRS) has the ability to share subject-matter expertise on topics such as toxicology, including in the form of telehealth and virtual consultation, to support the Rhode Island healthcare system's existing care capabilities
- Region 1's RDHRS has the ability to support HCRI and RIDOH in the interstate movement of patients to neighboring states in the region to maximize surge capacity

Concept of Operations

This section provides an overview of HCRI's response to a chemical emergency. It includes information related to the activation of an HCRI response, subsequent notification, roles and responsibilities of HCRI members in such a situation, logistical considerations, and processes to maintain situational awareness through both operational communications and public information.

Activation and Notifications

HCRI leadership may learn of a chemical emergency through the following routes:

- Direct notification to HCRI leadership and/or RIDOH's Center for Emergency Preparedness and Response
- Declaration of an on-scene MCI in the Patient Tracking System

HCRI will consider activation of this plan in the following situations:

- An incident involving the uncontrolled release of a hazardous chemical
- An incident involving several individuals exposed to a hazardous chemical
- The presentation of several individuals without notice to one or more hospital emergency department, who have been exposed to a hazardous chemical

- The deployment of CHEMPACK assets

Activation of this plan will be accompanied by activation of the HCRI Response Plan.

Following this plan's activation, HCRI leadership will issue notification to HCRI Core Members (hospitals, EMS, public health, and emergency management) via established communication mechanisms, including the Rhode Island Health Notification System. This notification will include relevant information available at that time, such as:

- General nature of incident
- Location
- Estimated number of casualties
- Estimated time until transport
- Need for hospitals to activate decontamination capabilities
- If known, chemical(s) involved

The need for notifications beyond HCRI's core membership will be determined at the time of the incident, based on its nature and scope.

Roles and Responsibilities

The following roles and responsibilities have been identified for HCRI members during a chemical emergency.

HCRI Leadership

- Activate the HCRI Clinical Advisor and provide Clinical Advisor a situational awareness briefing
- Issue prompt notification to Core HCRI members upon learning of an incident involving potential radiation exposure or contamination, with specific actions for certain members (e.g., hospitals) to take immediately (e.g., implement process to screen incoming patients for potential contamination, activate decontamination capabilities, identify number of available beds)
- (To the extent practicable) Attempt to establish communication with on-scene command for situational awareness, including efforts to identify chemical(s) involved in the situation
- Maintain situational awareness with Coalition members and stakeholders engaged in the response, including (as relevant):
    - Incident-specific care or treatment considerations
    - Information related to the activation of Community Reception Centers or similar sites to which uninjured, worried-well should be directed, if activated
- Coordinate resource requests within HCRI, facilitating member-to-member sharing
- Coordinate with Emergency Support Function 8 (if activated) and RIDOH to engage relevant regional and federal partners, including:
    - Region 1 ASPR Field Office for regional coordination
    - ASPR's Strategic National Stockpile to request medical countermeasures
    - ASPR's National Disaster Medical System (NDMS) to facilitate out-of-state patient movement and tracking, and, if necessary, additional federal resources such as Disaster Medical Assistance Teams and Disaster Mortuary Operations Response Teams
    - Region 1 RDHRS for regional situational awareness and facilitated access to clinical expertise

Hospitals

- Ensure accountability and safety of patients and staff
- Perform patient and staff decontamination
- Render patient care
    - When responding to a suspected **organophosphate or nerve agent exposure**, consider prompt request of CHEMPACK assets through RIDOH, at (401) 222-6911 (24/7)
- Respond to information and resource-availability requests from HCRI leadership
- Enter, as possible, emergency department self-presenters from the incident into the Patient Tracking System, linking those patients to the MCI assigned to the incident
- Coordinate with RIDOH's State Health Laboratories on any efforts related to biomonitoring or long-term exposure monitoring

EMS

- Ensure accountability and safety of patients and staff
- Respond to information and resource-availability requests from HCRI leadership and/or RIDOH's Center for Emergency Medical Services
- If applicable, respond to incident in accordance with *Rhode Island Mass Casualty Plan*
- Adhere to relevant treatment protocols and standing orders in the *Rhode Island Statewide Emergency Medical Services Protocols*
    - When responding to a suspected **organophosphate or nerve agent exposure**, consider prompt request of CHEMPACK assets through RIDOH, at (401) 222-6911 (24/7)
- Ensure appropriate and consistent use of Rhode Island's Patient Tracking System (PTS) to document transport destinations for the incident's victims, supporting later family-patient reunification efforts

Public Health (RIDOH)

- Respond to information and resource-availability requests from HCRI leadership
- Promptly respond to requests for CHEMPACK assets and initiate and coordinate processes for their deployment, in alignment with RIDOH's CHEMPACK Plan
- Provide access to RIDOH subject-matter experts (e.g., toxicological, occupational health)
- Through Emergency Support Function 8 at the State Emergency Operations Center, maintain situational awareness with partner State and local agencies
- Liaise with public health counterparts in neighboring states for situational awareness and resource sharing
- Maintain situational awareness with federal public health and medical partners (e.g., CDC, ASPR)
- Request, if necessary, medical countermeasures and other assets from Strategic National Stockpile
- Facilitate and expedite, as appropriate, any emergency healthcare-worker licensure requests/activities to support the surging healthcare system
- Facilitate any regulatory actions necessary to accommodate the use of out-of-hospital care capabilities (e.g., alternate care sites, field hospitals) to support the surging healthcare system
- Support family-patient reunification efforts by ensuring access, as appropriate, to information regarding the location of transported patients, including that gained through coordination with NDMS

- If fatalities are involved in the incident, coordinate with the Office of the State Medical Examiners on decedent management guidance and activities
- Work with the Rhode Island Emergency Management Agency (RIEMA) and federal partners to support federal and Emergency Management Assistance Compact (EMAC) requests for healthcare-related personnel and/or equipment
- Through the Rhode Island State Health Laboratories, develop and share incident-specific guidance with healthcare partners related to biomonitoring to measure the presence of chemicals or metabolites in exposed individuals' fluids or tissues

Emergency Management

- Respond to information and resource-availability requests from HCRI leadership
- Support the sourcing and sharing of non-medical resources with Coalition members
- Be prepared to establish and/or support the operation of one or more Community Reception Centers (CRC)
- Work with RIDOH and federal partners to support federal and Emergency Management Assistance Compact (EMAC) requests for healthcare-related personnel and/or equipment

Community Health Centers

- Be prepared for the presentation of patients from the incident with minor injuries, including minor burns, and provide initial care
- In coordination with HCRI, ensure patients presenting are directed to appropriate locations based on their condition, including to CRCs or other destinations, as directed by HCRI and/or RIDOH
- Coordinate with HCRI leadership to help promote the availability of services, including behavioral health, wound care, rehabilitation, etc., among community health centers to the broader HCRI membership, thus ensuring sufficient awareness to facilitate patients' transitions from acute care to recovery
- Respond to information and resource-availability requests from HCRI leadership, including those intended to identify available capacity among urgent care centers to accept low acuity patients requiring outpatient care who may have been displaced or otherwise diverted from hospitals

Urgent Care

- Be prepared for the presentation of patients from the incident with minor injuries, including minor burns, and provide initial care
- In coordination with HCRI, ensure patients presenting are directed to appropriate locations based on their condition, including to CRCs or other destinations, as directed by HCRI and/or RIDOH
- Coordinate with HCRI leadership to help promote the availability of services, including behavioral health, wound care, rehabilitation, etc., among urgent care centers to the broader HCRI membership, thus ensuring sufficient awareness to facilitate patients' transitions from acute care to recovery
- Respond to information and resource-availability requests from HCRI leadership, including those intended to identify available capacity among community health centers to accept low acuity patients requiring outpatient care who may have been displaced or otherwise diverted from hospitals

All Other HCRI Members

- Respond to information and resource availability requests from HCRI leadership

Logistics

HCRI has worked to establish several memoranda of understanding (MOU) that provide frameworks for resource sharing between Coalition members, including one specifically for hospitals, one for community health centers, and another for nursing homes and assisted living communities. Any of these MOUs could be leveraged to support the movement of resources, including supplies, equipment, and personnel, between member organizations.

HCRI, as it is co-led by RIDOH, also maintains close connection to Rhode Island's Emergency Support Function (ESF-8) 8 (led by RIDOH); this connection could allow HCRI to funnel resource requests through ESF-8/RIDOH to the Rhode Island Emergency Management Agency, which may be able to assist in the acquisition and deployment of resources from local, state, and federal sources.

As necessary, HCRI may also leverage its connections to regional and federal partners to access additional resources, including through the Region 1 Regional Disaster Health Response System, the Administration for Strategic Preparedness and Response's Strategic National Stockpile, and others.

(For more information, see HCRI Response Plan.)

The remainder of this section generally focuses on strategies and considerations for hospitals to maximize surge capability and capacity during chemical emergencies.

Space

Hospitals should seek to align surge-capacity planning related to establishing care capabilities in non-traditional spaces (e.g., triage outside the emergency department) with their planning related to chemical emergencies so as to avoid unintended intersections that could jeopardize safety or impede efficiency.

The operational footprint of an Emergency Treatment Area or other decontamination capabilities can be extensive. Hospitals should therefore plan accordingly and configure footprints to facilitate efficient flow through the decontamination process while seeking to eliminate or minimize the risk of secondary contamination to personnel, facilities, and other patients.

While their availability cannot be guaranteed during large-scale chemical emergencies, hospitals should seek to collaborate on their decontamination planning with regional fire-based decontamination teams. Not only can personnel from these teams provide subject-matter expertise to support hospitals' planning efforts, collaborative planning can also help facilitate interoperability if a fire-based decontamination team were available to deploy to a hospital in support of decontamination operations.

Staff

Because chemical emergencies can have rapid onsets, all hospitals preferably should have at least two staff members on duty in the hospital at all times (24/7/365) who are trained to

recognize a potential contamination event, don PPE, provide decontamination, and self-decontaminate. If this is not possible, the hospital should make prior arrangements to be able to have trained personnel on site within 15 minutes 24/7/365.

Hospitals should maintain lists of all staff who are up to date in their in the use of PPE and decontamination. Only those staff members on the list should be allowed to don PPE and/or perform decontamination (OSHA Standard 29 CFR 1910.120).

In addition to decontamination methods and techniques, personnel on hospital decontamination teams should establish and maintain familiarity and proficiency with the following topics:

- Identifying the presence of a hazardous substance
- Identifying potential contaminants to determine appropriate decontamination method(s)
- Selecting and using appropriate personal protective equipment
- Controlling the spread of further contamination
- Properly handling decontamination chemicals

Due to the time sensitive nature of such events, staff members who are involved in a decontamination response should be empowered to activate notification procedures and to call additional staff to the hospital for decontamination operations.

OSHA requires the Incident Command System (ICS) be used at all events involving hazardous materials. Therefore, at a minimum, ICS 100 should be required of staff members that are expected to wear PPE and perform decontamination. Likewise, staff members that are expected to wear a respirator (e.g., PAPR) must have medical clearance beforehand, and may require periodic fit testing. Appropriate medical monitoring of staff should occur prior, during and immediately after wearing PPE.

Supplies

Hospitals generally maintain their own respective caches of decontamination equipment and patient care supplies. If a facility lacks a particular resource that it requires to render patient care or support continuity of operations, it should proceed to contact HCRI leadership; HCRI leadership will in turn query other members and key stakeholders and will facilitate access to the needed resource, if available, including through the Inter-Hospital MOU or other mechanism. See HCRI Response Plan for more information.

Medical Countermeasures

For patients exposed to chemical nerve agents or organophosphate, contact RIDOH's Center for Emergency Preparedness and Response (401-222-6911) for access to CHEMPACK support. (See CHEMPACK Field Operations Guide for more information.)

If a medical countermeasure is required by a hospital or healthcare facility that does not have immediate access to it, HCRI can coordinate healthcare system-wide queries for its availability, as well as facilitate access to sources outside the State of Rhode Island, in collaboration with RIDOH.

Communications

Effective communication is essential to establishing and maintaining situational awareness among response partners and the general public.

Operational Communications

The following communications systems may be employed by HCRI members during a response to a chemical emergency, in alignment with the Rhode Island Statewide Healthcare Tactical Communications Plan:

- Voice
  - Telephone (landline, cellular, satellite)
  - 800 MHz RISCON system
  - HEAR radio system
- Video
  - Microsoft Teams
  - Zoom
- Data
  - Email
  - Text/SMS
  - Hospital Capacity System
  - Patient Tracking System
  - Basecamp
  - WebEOC

For more information on their use, see the Rhode Island Statewide Healthcare Tactical Communications Plan.

Public Information

HCRI will work to facilitate and support connections between the public information campaigns led by state/local authorities and those of the healthcare sector. This may include convening conference calls or other collaborative opportunities with healthcare public information officers (PIO) and PIOs of RIDOH and other responding agencies.

Safety and Control Measures

Chemical emergencies frequently involve the potential for contamination and secondary contamination, and therefore require particular attention and effort on the part of responders and healthcare professionals to limit such potential.

Responder and Personnel Health and Safety

Efforts to protect the health and safety of responders can be supported by the implementation of screening and monitoring procedures and the use of appropriate personal protective equipment (PPE).

Screening and Monitoring

(*Adapted from* OSHA's Best Practices for Hospital-Based First Receivers of Victims of Mass Casualty Incidents Involving the Release of Hazardous Substances. *The principles outlined below should also be considered in pre-hospital settings when operating in full PPE.*)

The combination of first receivers' activities and PPE often create a greater physical workload for employees than they experience during their normal daily jobs. Thermal stress (heat and cold stress) also impacts the period for which first receivers can perform their duties. Hospitals should consider monitoring employee vital signs as one method of tracking employee response to these stressors.

For example, evaluate each employee's vital signs before that individual dons PPE: Prior to a team member donning a protective suit and hooded PAPR respirator, a technician records the individual's weight, vital signs, and recent medical history. This information is obtained as other team members assist the individual into the protective gear. If vital signs exceed predetermined limits set by the hospital organization, the individual is prohibited from wearing PPE that day and the team member's activities are restricted accordingly. When PPE is removed, vital signs and weight are recorded again. The employee's time in PPE is also recorded and tracked.

Incidents involving hazardous substances are typically one-time incidents and medical monitoring is not required unless an employee develops signs or symptoms related to an exposure. Following such an occurrence, the hospital's occupational health provider should follow the hospital's regular policy regarding a chemically exposed worker.

Understandably, disasters can be a notable source of stress for anyone involved. Hospitals should consider including a behavioral health safety officer in its decontamination operations. While assisting with decontamination activities, this employee also observes team members for symptoms of excessive stress.

Personal Protective Equipment

(*Adapted from* Chemical Decontamination *[Johnston and Willis, 2023]*)

PPE functions as a barrier between the responder and the environment or an exposed victim. PPE is classified into levels A, B, C, and D depending upon the level of protection offered. Each classification designates a level of protection for the respiratory system, body, eyes, face, hands, and feet. The highest degree of protection is level A protection, but healthcare facilities generally do not have PPE capability higher than level C.

Level A protection is used in situations where there is a high potential for exposure to harmful vapors or particles, areas of poor ventilation with limited or no breathable atmosphere, or areas with a high potential for skin contact with a known hazardous substance. The hallmark of level A protection is that it is completely self-contained and therefore is vapor impermeable. PPE for level A exposure includes:

- Full-facepiece self-contained breathing apparatus, or positive pressure supplied area with a secondary self-contained breathing apparatus.
- Encapsulating protective suit
- Chemical resistant outer and inner gloves
- Chemical resistant steel-toed boots
- Disposable complete outer suit, worn over the encapsulating suit

Level B protection, like level A, is a capability that is generally used by highly trained HAZMAT personnel and is not typically available for use at healthcare facilities. It does share the capability of having a self-contained breathing apparatus, but unlike level A, it is not vapor-impervious. This level of protection is utilized in situations of low oxygen concentration or when vapors are present that are not thought to pose a high risk of skin absorption, such as

organophosphate insecticide or military-grade weapon. The components of this level of protection include:

- Full-facepiece self-contained breathing apparatus, or positive pressure supplied area with a secondary self-contained breathing apparatus
- Hooded chemical resistance clothing with a face shield
- Chemical resistant outer and inner gloves
- Chemical resistant steel-toes boots with an outer disposable covering

Level C protection, as noted previously, is the highest level of PPE utilized by most healthcare facilities. Level C is utilized in a situation when there is a high possibility of dangerous air contaminants or if there is a possibility of hazardous liquid splashes. The primary difference between level B and level C protection is the absence of a self-contained breathing apparatus. It is important that receiving stations, such as emergency departments, have the needed components of this level of protection pre-stock and prepared for rapid deployment in the event of a short or immediate-notice patient who is contaminated with a potentially hazardous chemical. PPE for level C protection includes:

- Air-purifying respirator that is either full-face or half-mask
- Hooded chemical-resistant clothing with face-shield.
- Chemical resistant outer and inner gloves
- Steel-toed boots with an outer disposable cover

Level D is the lowest degree of protection and should be utilized when the atmosphere contains no known airborne contaminant. There is no risk for inhalation or contact absorption of a hazardous chemical. While offering little in the way of hazardous chemical protection, this is the most likely PPE level utilized when a victim is received at a healthcare facility. Therefore, a plan must be in place to enable treating personnel to don additional protective equipment rapidly. Level D components include the following:

- Face shield
- Chemical splash goggles or safety glasses
- Gloves
- Boots or shoes
- Work uniform

Decontamination

(*Adapted from* FEMA's Hospital Emergency Response Training for Mass Casualty Incidents)

Patients may be decontaminated at the incident scene, or they may arrive contaminated at the hospital and, therefore, must be decontaminated upon arrival. Normally, gross decontamination takes place at the incident scene. This procedure removes the majority of contaminant on the patient so that responders can provide immediate care and transport the patient to the hospital.

Once arriving at the hospital, the patient requires further decontamination before being admitted into the hospital for follow-up care. Gross decontamination at the incident scene typically consists of a low-pressure wash down with a fire hose or other available water system.

Survey and Monitoring

Determination of the patient's status (clean or contaminated) is accomplished both visually and with specialized equipment. No single system can detect all hazardous materials or chemical agents.

1. The first step is to look at the patient to determine if there is visible contamination on the patient's body and clothes.

2. Second, the patient is observed to detect any reactions and symptoms of contamination.
3. Finally, survey equipment is used to detect contamination and tentatively identify the contaminant present.

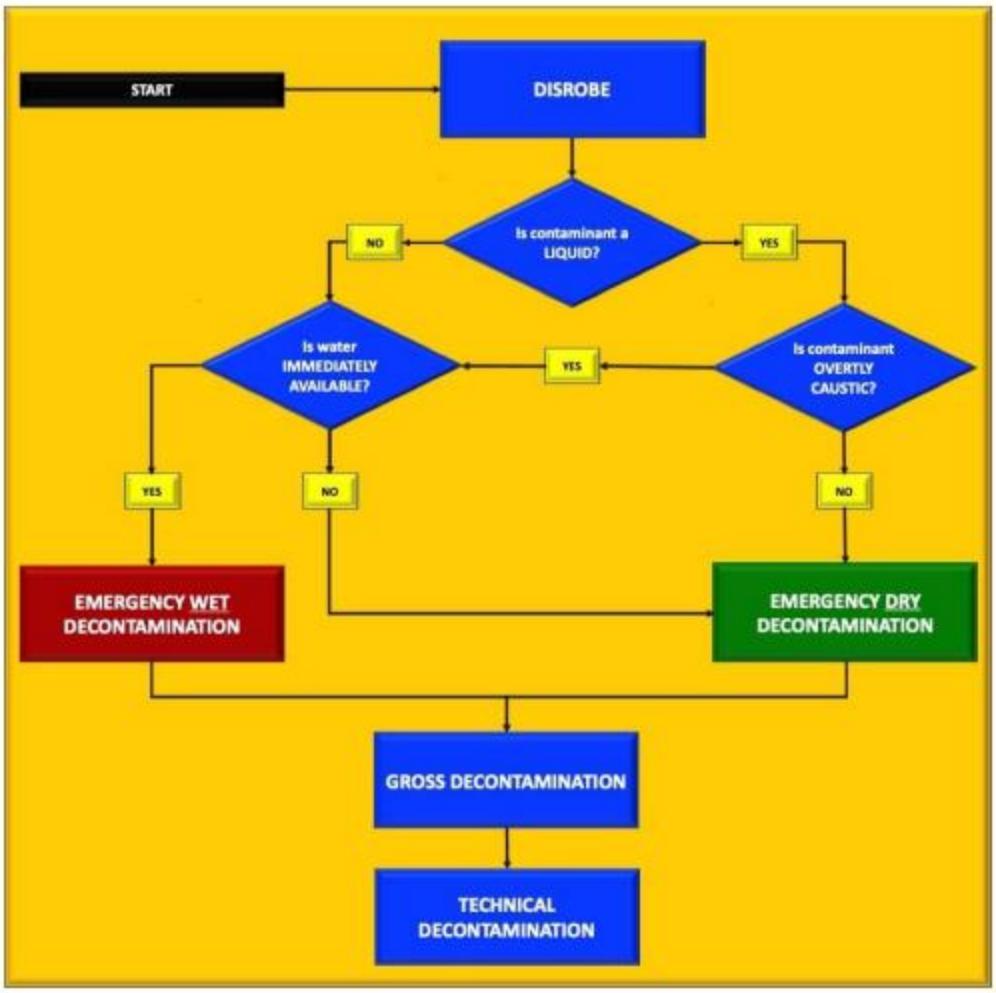
For some agents or materials, symptoms might not be specific enough. Healthcare responders use survey and monitoring equipment to confirm contaminant location, type, and concentration. This confirmation helps to determine the necessary level of protection, first aid, and decontamination measures.

No single method can detect all hazardous materials or chemical agents. There are many different types of methods, from very simple chemical-reactive papers (that work in seconds) to very sophisticated laboratory instruments (that can take from minutes to hours to give results). Simple methods provide broad information, while complex methods provide detailed information.

Types of Decontamination

There are several approaches to decontamination, based on the contaminant, the availability of capabilities, and other considerations.

The following flowchart (from the Primary Response Incident Scene Management (PRISM) guidance) is intended to guide determinations about which type of decontamination may be appropriate, based on certain circumstances. What follows the flowchart is an overview of the various types of decontamination that might be employed in a response.



- **Emergency Decontamination**. Emergency decontamination, synonymous with "self-care decontamination", is the phrase used to emphasize the time-critical process for the immediate removal of hair or skin contamination by any available means and can be divided into "dry" and "wet". A study sponsored by HHS revealed that 99% of chemical contamination can be eliminated by carefully removing clothes and wiping skin with a paper towel or dry wipe.
    - Emergency dry decontamination is the default option and should be performed with any available absorbent material.
    - Emergency wet decontamination should only be used when the contaminant is caustic (e.g., provokes immediate skin irritation) or is particulate in nature and should be performed using any immediately available source of water at an appropriate temperature (i.e., not exceeding 40° C or 104° F).

- **Gross Decontamination**. Gross or hasty decontamination is normally performed at the incident site. Gross decontamination removes loose contamination from skin and remaining clothes.
    - Gross decontamination should be performed as quickly as possible.
    - High-pressure water systems are discouraged because they may force contaminant through the patient's skin, increasing contamination of the patient and spreading contamination throughout the environment.

- **Secondary Decontamination**. Secondary decontamination is performed following gross decontamination and after a patient has been removed from the hot zone. Hospital personnel may need to perform secondary decontamination of patients who have undergone gross decontamination at the incident site.
    - Secondary decontamination is performed on an as-needed basis and may be limited to specific areas of the body. Secondary decontamination is more thorough than gross decontamination.

- **Technical Decontamination**. Technical decontamination refers to the removal of contamination from responders and equipment in a very deliberate and time-consuming fashion. This process is used especially for responders in PPE and for equipment—it is not used on patients.
    - Technical decontamination uses solvents or alkaline solutions to neutralize or inactivate the contaminating substance. Healthcare responders should conduct technical decontamination in a location separated visually from patient decontamination for psychological reasons.
    - PPE should be carefully and thoroughly cleaned. Speed is not the goal of technical decontamination. Technical decontamination concentrates more on completely removing the contaminant from PPE.

For more information on decontamination in both prehospital and hospital settings, see Prehospital Decontamination and Hospital Decontamination, below, respectively.

Environmental Concerns

(*Adapted from* ATSDR's Medical Management Guidelines for Acute Chemical Exposures *and* OSHA's Best Practices for Hospital-Based First Receivers of Victims of Mass Casualty Incidents Involving the Release of Hazardous Substances)

Byproducts of chemical emergencies, such as contamination and waste, can present additional health and safety concerns that should be considered.

Secondary Contamination

Secondary contamination refers to the transfer of material from the victim to personnel or equipment. The potential for secondary contamination has implications for decontamination and triage of victims and for the protection healthcare personnel. Immediate patient decontamination is recommended for materials that pose risks of secondary contamination; this eliminates both the potential for personnel contamination and further exposure to the patient.

Hospitals should plan to clean equipment and surfaces during and after decontamination operations. Cleaning should be performed by properly protected and trained personnel. Items that cannot be decontaminated safely should be processed for appropriate disposal. It is unlikely that portable gear could be adequately decontaminated after an incident involving a persistent or highly toxic agent and should therefore be disposed of accordingly.

Solid Waste

Solid waste generated during victim decontamination activities should be treated as hazardous waste following facilities' existing hazardous waste management procedures. This may involve coordination with a contracted hazardous waste management company to test and dispose of waste that is considered hazardous (except for any items required by law enforcement as evidence).

For emergencies involving only a few contaminated patients, facilities can use plastic bags to collect individual's contaminated clothing for disposal. The bags should be sealed and double-bagged or put in hazardous waste containers, then stored in existing secure hazardous waste storage areas until disposal. For larger-scale emergencies, this waste could be placed in hazardous waste barrels, if available in the facility. Sealing bags and closing the containers is important to eliminate contaminated materials as possible continuing sources of exposure.

In response to some incidents, law enforcement authorities might request that certain types of waste be retained as evidence. In that case, the law enforcement agency will provide instructions on handling the waste.

Wastewater

During an emergency, first receivers should take all necessary steps to save lives, protect the public, and protect themselves. Once imminent threats to human health and life are addressed, first receivers should make all reasonable efforts to contain contamination and avoid or mitigate environmental consequences (US EPA, 2000).

Wastewater from decontamination showers can contain low-level concentrations of the substance(s) with which patients were contaminated. Given the opportunity to plan for decontamination activities (by designing and installing or purchasing decontamination facilities, developing procedures, and preparing staff), hospitals should consider the management of decontamination shower water as part of the plan.

HCRI leadership will coordinate with the Department of Environmental Management at the time of the incident to determine any situation-specific guidance or direction on the management of wastewater, which will then be promptly shared with HCRI members.

Medical Care Operations

The following section provides considerations related to aspects of medical care operations, including prehospital care, patient transport, hospital care, medical countermeasures, biomonitoring, and fatality management.

Prehospital Care

Prehospital care for patients exposed to a chemical substance should be guided by the Rhode Island Statewide Emergency Medical Services Protocols. Relevant protocols include (but are not limited to):

- Multiple Patient Incident (Mass Casualty Incident)
- Chemical and Electrical Burn Injury
- Toxicological Emergencies - General - Adult
- Toxicological Emergencies - General - Pediatric
- Toxicological Emergencies - Nerve Agent or Organophosphate Toxicity
- Carbon Monoxide Exposure
- Fire Ground and Extended Operation Rehabilitation

Prehospital Triage

Prehospital triage by EMS in mass casualty incidents should be guided by the Rhode Island Statewide Emergency Medical Services Protocols' Multiple Patient Incident protocol. Additional considerations related to chemical emergencies include:

- Survey for evidence of associated traumatic and blast injuries.
- Observe for sweating, labored breathing, coughing, vomiting, secretions.
- *Severe* casualty triaged as immediate if assisted breathing is required.
- Blast injuries or other trauma, where there is question whether there is chemical exposure, victims must be tagged as *Immediate* in most cases. Monitor for blast injuries' delayed effects, such as acute respiratory distress syndrome, etc.

The US Department of Health and Human Services' Chemical Emergency Medical Management (CHEMM) program has developed a set of triage considerations for specific chemicals:

- Ammonia
- Chlorine
- Hydrogen cyanide
- Mustard agents
- Nerve agents*
    - **If nerve agent/organophosphate exposure is suspected, consider prompt request for CHEMPACK assets through RIDOH (401-222-6911) (24/7)*
- Phosgene

Prehospital Decontamination

Updated in 2019, the Primary Response Incident Scene Management (PRISM) guidance provides authoritative, evidence-based best practices for mass patient decontamination during chemical emergencies. This guidance should be consulted for prehospital decontamination operations.

PRISM comprises three volumes:

- Volume 1: Strategic Guidance
  Presents a review of best practices, collates available evidence, and identifies areas that require further investigation. The document is relevant to senior incident responders (e.g., Incident Commanders) and those responsible for emergency planning and civil contingencies, as it describes the supporting technical information that underpins the rationale for each stage of disrobe and decontamination and highlights potential issues or challenges.

- Volume 2: Tactical Guidance
  The second volume provides an overview of the processes involved in mass patient disrobe and decontamination and the rationale that underpins each process. The document does not include supporting technical information or potential challenges. Volume 2 has particular application in the training and exercising of first responders and officials involved with domestic preparedness and emergency management.

- Volume 3: Operational Guidance
  The salient features of mass patient disrobe and decontamination are presented in Volume 3, which aims to provide all Federal, State, Tribal and local first responders with a simple, readily accessible guide to critical aspects of the incident response processes.

Patient Transport

Patients should ideally be decontaminated prior to transport by EMS. Contamination of an ambulance, and the EMS personnel associated with it, could cause them to be removed from service and decrease the availability of these critical resources. EMS responders should communicate with other first responders and decontamination teams regarding the extent of patient exposure and the decontamination processes used to clean patients. This information will help ambulance operators ensure that only uncontaminated/clean patients are loaded into the vehicle. EMS responders who suspect residual contamination on a patient should not hesitate to suggest that the patient be returned to the wash area for additional cleaning.

In practice, however, it is possible that EMS personnel could discover evidence of contamination associated with a patient who is already being transported, although that patient was believed to be clean. In this situation, efforts should focus on minimizing further spread of the contaminant and on (further) decontamination. Ambulance operators should take the following steps:

En route

- Notify the receiving hospital that the incoming patient shows evidence of possible contamination so that decontamination procedures can be activated.
- Verify that all clothing and personal effects are completely removed and sealed in plastic bags (double layer).
- Take available steps to contain the spread of contamination to vehicle and personnel (e.g., wrap patient in disposable tarp or blanket if allowed by patient care protocol).
- Alert the incident site that a patient in transit shows signs of contamination (describe the evidence) so that ongoing patient handling and decontamination procedures at the site can be modified appropriately.

Upon arrival at hospital

- Treat EMS responders as victims, requiring decontamination and/or treatment, until it is possible to confirm that they have not suffered ill effects.
- Remove the ambulance from service and arrange to have it surveyed immediately to determine whether it can be placed back in service.

For more information, see *OSHA's Best Practices for Protecting EMS Responders during Treatment and Transport of Victims of Hazardous Substance Releases*.

Patient Transport Destinations

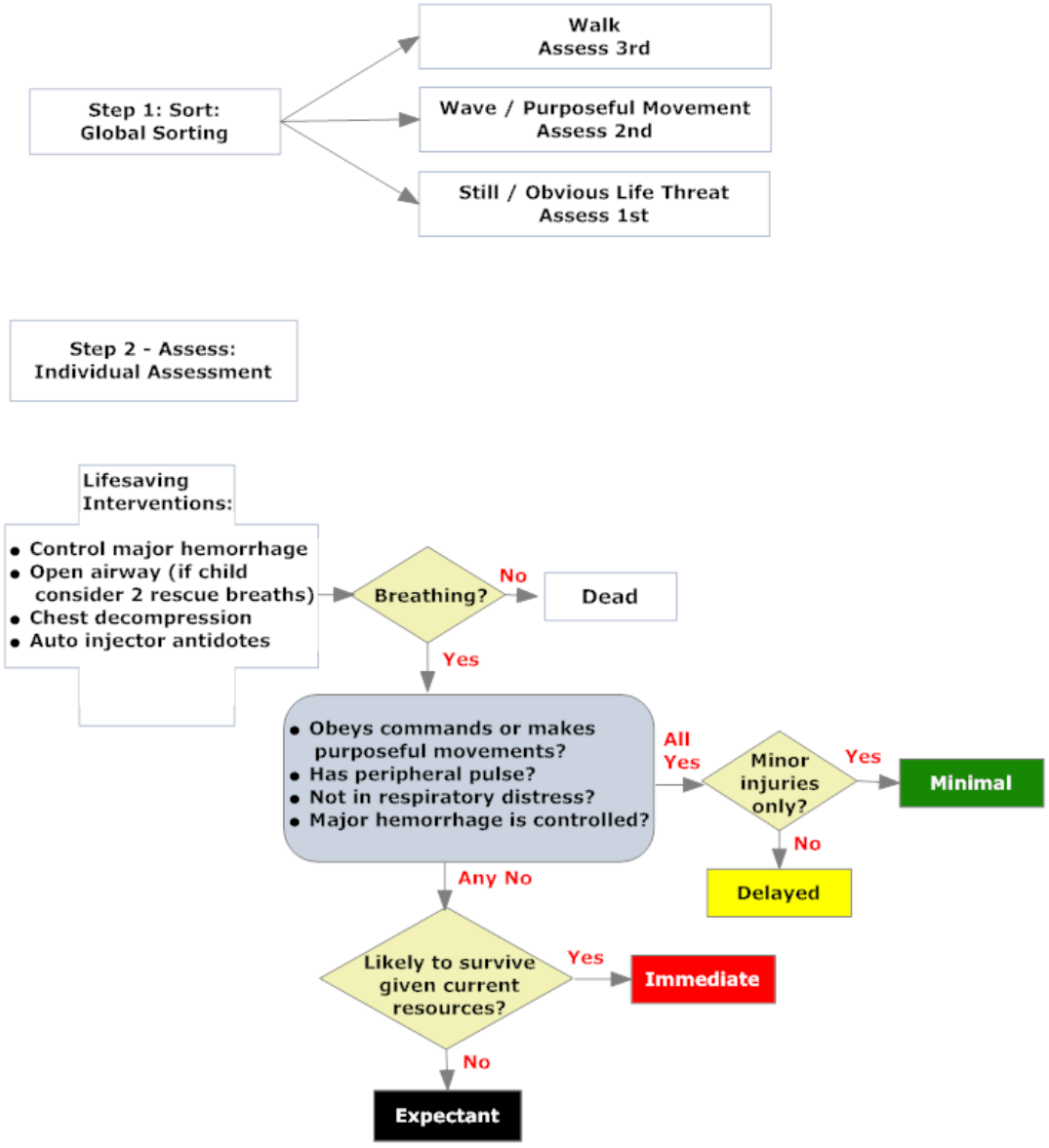
Depending on the nature and scope of the chemical emergency, and particularly if it involves the need for specific care capabilities or medical countermeasures (e.g., a nerve agent release for which CHEMPACK is deployed), RIDOH may coordinate with the on-scene incident commander to provide guidance on appropriate patient transport destinations. The intent of this coordination will be to ensure that patients are transported to hospitals that have the necessary care resources available.

Hospital Care

The following section includes considerations for the care of individuals with chemical exposure or injuries in the hospital (including emergency department) setting.

Triage and Screening

Hospital personnel should consider the use of the SALT (Sort, Assess, Lifesaving Interventions, Treatment/Transport) triage system (below) to assess patients presenting to their facilities.



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- Ammonia
- Chlorine
- Hydrogen cyanide
- Mustard agents
- Nerve agents*
    - **If nerve agent exposure is suspected, consider prompt request for CHEMPACK assets through RIDOH (401-222-6911) (24/7)*
- Phosgene

Hospital Decontamination

Hospitals should be prepared to rely primarily on their own resources to establish and conduct decontamination operations; this includes personnel. Available support through municipal (fire department-based) decontamination teams may be limited in large-scale emergencies.

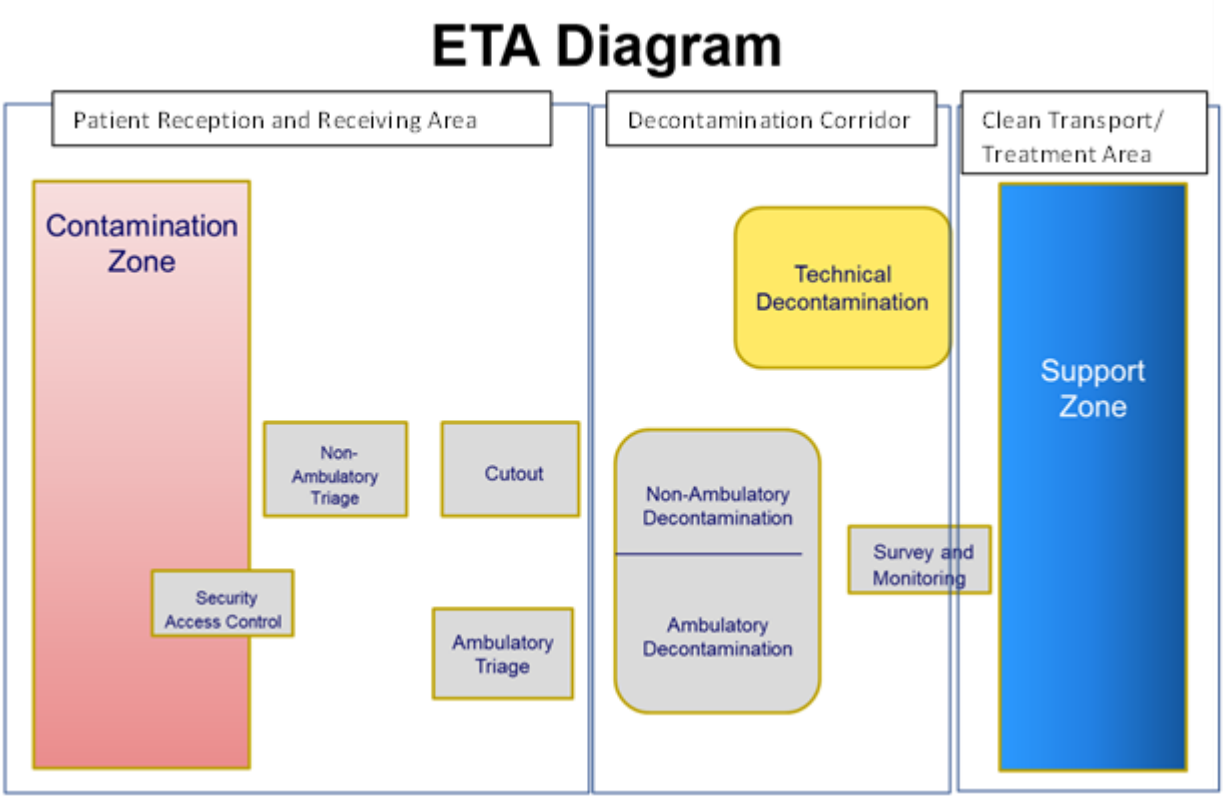
Emergency Treatment Area

The Emergency Treatment Area (ETA) represents a complete system designed to receive, triage, and process contaminated patients by providing emergency medical treatment and admission into the hospital. The ETA is a complex system relying on team members to orchestrate emergency procedures using specialized equipment to decontaminate patients and provide medical treatment on short notice. An ETA is designed to process contaminated patients from a chemical incident. The overall goal is to assess, decontaminate and when necessary, treat patients from a chemical emergency. The ETA is established as a controlled area with a defined perimeter and enforced safe practices.

The ETA requires a large staff and significant amounts of equipment for successful operation. The ETA is established outside a hospital building; therefore, all necessary equipment must be moved into place when the response begins.

Typically, an ETA is established as one area with three sections. These sections are building blocks toward accepting patients, assessing their injuries, and processing them into the hospital:

1. The first section is the **patient reception and receiving area**. It accommodates triage and control procedures. As the patient entry point, it is considered a contaminated zone where staff self-protection is required.
2. The second section is the **decontamination corridor**. This area accommodates contaminant removal from ambulatory and non-ambulatory patients.
3. The third section is the **clean treatment and transport area**, which provides medical care, secondary triage, and transport functions.



Components of an Emergency Treatment Area

ETAs include the following components, as illustrated in the above diagram:

- Security
- Triage
- Cutout
- Decontamination (Ambulatory, Non-Ambulatory)
    - **Patient Registration**. Every patient is logged into the system and given two identically numbered tags. This identifies the patient and his or her clothing and valuables. The tag number also relates the patient to all further records of treatment. One tag is placed around the patient's neck, and the other is attached to a clothing bag.
    - **Clothing Removal**. This area must be enclosed for modesty and privacy. It does not require individual stalls. However, if equipment is available, stalls could provide further privacy. Staff members of the same gender as those processing through the line should be available to assist individuals in each station along the corridor.
        - At the clothing removal station, patients remove all clothing and personal property. Clothing is placed in a plastic bag and sealed. Personal property (e.g., jewelry, wallets) is placed in a separate plastic bag and sealed. Both bags are then placed in a third plastic bag, which is also sealed.
        - The person's second number tag is attached to the sealed bag. This bag is then turned into a staff member. The staff member logs the bag and stores it in the designated area. All clothing and personal possessions will be processed through a separate line.
    - **Dry Decontamination**. After disrobing, dry decontamination using absorbent materials is performed.
    - **Wet Decontamination**

        - **Rinse Station**. This station includes a quick overhead shower rinse to remove gross contamination. It is followed by a complete wash. All water must come from above the patients to wash contamination away from the head and toward the floor.
        - **Wash Station**. In the wash station, the patient will wash and scrub with soap and water, for a designated length of time. This station must ensure free-flowing overhead water to remove all soap and residual contamination. Wash time should be a minimum of five to eight minutes.
        - **Drying Station**.
    - **Survey and Inspection Station**. After washing and rinsing, the patient must be checked for residual contamination. This station is staffed by personnel utilizing contamination detection equipment. In this section, the patient is checked to verify that any residual contamination is eliminated. Clean patients move to the dressing area while those found to be contaminated return to the wash station.
    - **Dressing Station**. Hospital gowns or other hospital-provided clothing is given to each patient. The clothing should protect the modesty of the individual as the patient moves from the exterior of the hospital into the ED for follow-up treatment.
- Survey and Monitoring
- Technical Decontamination
- (Optional) Treatment

PPE for Hospital Decontamination Operations

(*Adapted from OSHA's* Best Practices for Hospital-Based First Receivers of Victims from Mass Casualty Incidents Involving the Release of Hazardous Substances)

The following personal protective equipment is recommended by OSHA for hospital-based decontamination operations:

Zone	Minimum PPE
Hospital Decontamination Zone • All personnel in this zone (e.g., decontamination team members, clinicians, set-up crew, cleanup crew, security staff)	• Powered air-purifying respirator (PAPR) that provides a protection factor of 1,000. The respirator must be NIOSH-approved. • Combination 99.97% high-efficiency particulate air (HEPA)/organic vapor/acid gas respirator cartridges (also NIOSH-approved). • Double-layer protective gloves. • Chemical-resistant suit. • Head covering and eye/face protection (if not part of respirator). • Chemical-protective boots. • Suit openings sealed with tape.
Hospital Post-Decontamination Zone • All personnel in this zone	• Normal work clothes and PPE, as necessary, for infection-control purposes (e.g., gloves, gown, appropriate respirator).
Scope and Limitations This table applies when: • The hospital is not the release site • The identify of the hazardous substance is unknown	

Decontamination Procedures

Guidance for hospitals on performing decontamination can be found in Attachment 2: Hospital Decontamination Procedures.

Additional guidance can be found in OSHA's *Best Practices for Hospital-Based First Receivers of Victims from Mass Casualty Incidents Involving the Release of Hazardous Substances*.

While intended primarily for operations at an incident scene, the PRISM guidance may also be consulted to inform hospital-based decontamination operations.

Substance Identification through Laboratory Analysis

In addition to efforts at the incident scene to identify the hazardous substance(s) involved, hospitals should consult the Rhode Island Department of Health's *Training Manual for Chemical Threat Specimen Collection, Packaging, and Shipping*, which includes guidance and procedures for accessing the services of RIDOH's Chemical Threats Laboratory.

RIDOH's Chemical Threats Laboratory maintains the capabilities to detect exposures to a number of toxic chemical agents. For more information, see the RIDOH's Chemical Threats Preparedness and Response program.

To contact RIDOH's Chemical Threats Laboratory, call (401) 222-5906 or (401) 222-6911 (emergency only).

Treatment

(*Adapted from* Hazardous Chemical Emergencies and Poisonings, NEJM*)*

It is likely that patients will arrive at hospital emergency departments before the chemical(s) they have been exposed to have been definitively identified. Clinicians should therefore evaluate patients' signs and symptoms to identify corresponding toxidromes, which can then guide their further evaluation and preliminary treatment.

General emergency and life support guidelines should be followed. Critically ill patients may require immediate resuscitation before or concurrently with decontamination. Resuscitation, which is performed by emergency personnel wearing PPE, should begin with a primary survey assessing and stabilizing airway, breathing, and circulation at the same time patients are examined for burns, trauma, and other injuries. Severe chemical injury can affect the central nervous system (altered mental status, convulsions, or unresponsiveness), the respiratory system (respiratory insufficiency and/or bronchospasm), and cardiovascular system (hypotension, bradycardia, tachycardia, or cardiovascular collapse).

Patients presenting with signs and symptoms that fit with a clinical toxidrome that has an antidote should have empirical antidotal therapy administered expediently using the proper dose and route. For example, early administration of naloxone to patients with an opioid toxidrome, atropine and pralidoxime to patients with a cholinergic toxidrome, or hydroxocobalamin to a patient with suspected cyanide exposure is potentially lifesaving (see antidote and toxidrome details below).

General supportive care should be provided based on patient signs and symptoms. As clinically indicated, anticonvulsive medications such as benzodiazepines and other medications needed to maintain physiologic homeostasis should be provided as soon as possible. For patients with hypotension, it is generally recommended to give isotonic intravenous fluids (e.g., 0.9%NS). For refractory hypotension consider pressor support. For patients with bronchospasm provide

inhaled or nebulized bronchodilators. Can consider steroids for severe airway reactivity, but consider data is mixed depending on the specific chemical agent exposure. For hypoxia provide oxygen. For patients with signs of impending respiratory failure additional respiratory support including positive pressure ventilation or intubation will be needed. Additionally, airway supports including intubation may be needed in patients with hoarseness, stridor, upper-airway burns, wheezing, or altered metal status. For patients experiencing seizures they should be treated with benzodiazepines and/or other anticonvulsive medications as is clinically indicated. If they occur treat cardiac arrythmias according to ACLS. Treat traumatic injuries according to ATLS. Electrolytes should be repleted as appropriate.

Treatment approaches should be refined as more data on the specific causative agent becomes available. Medical guidance can be provided by regional poison control centers (1-800-222-1222). A period of observation should be instituted to see if patients will develop symptoms and/or evaluate for progression of symptoms. This observation period should be adjusted to fit the specific chemical involved when the exposure agent is identified. The timing of symptom onset can vary depending on the type of chemical exposure and dose. For example, the onset of symptoms with chlorine gas inhalational exposures should be within six hours, but with phosgene exposure lung injury can occur as late as 15 to 48 hours after the exposure in individuals that were initially asymptomatic.

Mental health supports should be readily available for both patients and staff as chemical disasters pose significant risk of psychic trauma. Mobilizing mental health services should be a part of the hospital chemical disaster response plan.

Many of the substances included in ATSDR's Toxic Substances Portal include Medical Management Guidelines for Acute Exposure, intended to aid emergency department physicians and other healthcare professionals in the clinical management of patients who may have been exposed to the substance. Once a hazardous substance to which patients have been exposed has been identified, the Toxic Substances Portal should be consulted for additional guidance.

Medical Countermeasures
(*Adapted from* Hazardous Chemical Emergencies and Poisonings)

Some chemicals have specific medications or antidotes to treat the effects of exposure.

Chemical	Toxidrome	Available Treatments	Additional Information
Nerve agents/ organophosphates	Cholinergic toxidrome	Atropine, pralidoxime; Benzodiazepines as needed for seizures	Promptly request deployment of CHEMPACK assets by calling 401-222-6911.
Opioids	Opioid toxidrome	Naloxone	
Cyanide	Knockdown toxidrome	Hydroxocobalamin, sodium thiosulfate, sodium nitrite	
Hydrofluoric acid	Irritant/corrosive	Parenteral and local calcium preparations; replete magnesium as needed	
Carbon monoxide	Knockdown toxidrome	100% oxygen, consider hyperbaric oxygen	
Methemoglobin inducers	Knockdown toxidrome	Methylene blue	

Hydrogen sulfide	Knockdown toxidrome	Consider sodium nitrite, hydroxocobalamin (limited data)	
Sulfur mustard	Irritant/corrosive	If neutropenia, can consider granulocyte-colony stimulating factors in consultation with hematology	

Clinical Support

At the onset of a chemical emergency, HCRI leadership will establish contact with the Coalition's Chemical Surge Clinical Advisor to determine any incident-specific guidance that should be conveyed to HCRI members regarding patient care; HCRI will work to promptly share that information with members through established channels (e.g., HCS General Alert, Rhode Island Health Notification System). HCRI leadership will maintain coordination with the Clinical Advisor as the response evolves to support situational awareness within the Coalition, including facilitating access to the Clinical Advisor by other healthcare professionals at HCRI member facilities.

Additional clinical support can be sought through the Regional Poison Control Center. Support through Poison Control is available both online (through webPOISONCONTROL) and by calling 1-800-222-1222.

HCRI members may be able to access additional telemedical support through the Region 1 RDHRS. The RDHRS has developed a rapidly deployable, easy-to-use, HIPAA-compliant disaster telemedicine platform. Through this system, clinicians can submit specialty consultation requests and remote clinical experts can then provide essential clinical advice to assist in the triage and/or treatment of patients. In the event of its activation and use, RIDOH will work to rapidly ensure the licensing of out-of-state clinicians accessed by HCRI members through this capability, as necessary.

Fatality Management

RIDOH's Office of the State Medical Examiners (OSME) will coordinate with local authorities on the need for the field decontamination of decedent remains prior to their removal from an incident scene.

Decedent Decontamination

(*Adapted from* Decontamination and Management of Human Remains following Incidents of Hazardous Chemicals Release)

The degree of hazard posed by potentially contaminated human remains may not be readily characterized, especially during the acute phases of a chemical release incident when focus is often on care and treatment of the living. As a consequence, pre-response planning and establishment of effective and respectful decision criteria for human remains decontamination is advised and will require knowledge and advance consideration by responsible parties.

An "external residual chemical hazard" refers to the chemical compound of concern remaining on the skin, hair, or clothing. External residual chemical hazards represent the primary source of exposures to mortuary personnel transporting or handling remains during recovery activities.

Specifically, any residual liquid chemical agent on the decedent's clothing, hair, and remains (potential direct skin absorption pathway) and the associated off-gassing vapors (potential inhalation and ocular exposure pathways) are the most critical hazards at this point. Risk will be greatest during field collection procedures, particularly if these activities occur within minutes to a few hours following a chemical release. During decontamination procedures such as those associated with the flushing and cleansing of wounds, a contact chemical hazard may exist. Appropriate protective equipment will adequately protect personnel from residual contact hazard as well as associated off-gas vapors.

A first and critical element of safe management is the early determination as to whether remains are likely to have been contaminated in the first place. Because of vapor dissipation mechanisms, many common chemical terrorist or accidental release scenarios (which emphasize the likelihood of airborne vapor releases of volatile chemical compounds) will not present a substantial residual hazard requiring application of additional procedures beyond those routinely used by mortuary affairs personnel or medical examiners and their staff.

As cross-contamination by liquid-agent-contaminated remains can significantly increase overall decontamination complexity, it is recommended that those remains exhibiting positive indications or readings of chemical presence should be segregated and processed separately from those exhibiting no evidence of contamination, as determined by physical determinations or detection equipment results.

The most contaminated remains can be identified by:

- Evidence of gross liquid contamination on remains or associated items and nearby surfaces; any indication of suspicious liquid is grounds for an initial "high hazard" determination
- Field instrument positive readings or detectable off-gassing vapor hazard from remains or area around the collection point
- Remains from areas where others have reported signs and/or symptoms compatible with chemical agent exposure

Additional guidance on the decontamination of decedent remains can be found in Attachment 3.

Special Considerations

The following are planning considerations to support the efforts of Coalition members in the development of their respective chemical response plans.

Behavioral Health Implications

(*Adapted from the* Center for the Study of Traumatic Stress's Psychological and Behavioral Issues Healthcare Providers Need to Know When Managing a Chemical, Biological, Radiological, or Nuclear Event)

An event involving exposure or potential exposure to chemical, biological, radiological, or nuclear (CBRN) agents will create fear and uncertainty. While CBRN agents have occasionally been used for malicious purposes, such as by terrorists, most exposures are unintentional and result from the failure of or damage to man-made systems designed to contain and safeguard the population. The man-made nature of a CBRN event often increases the likelihood and severity of adverse psychological effects. Following widespread exposure to a CBRN agent, the

management of acute psychological and behavioral responses will be as important as the treatment of any CBRN-related injuries and illnesses.

CBRN exposure is often a dreaded threat seen as catastrophic with the potential for severe illness, injury, or death. Radiation is invisible, odorless, and unknown. These ingredients stimulate worst-case fantasies. People must often rely on healthcare professionals and scientists to determine whether or not a person has been exposed and/or the extent to which the exposure occurred. Exposure to a CBRN agent may not manifest immediately. The health effects of CBRN exposure can also lead to delayed effects on future generations, both physiologically and psychologically. Those who have been exposed or anticipate possible exposure feel a sense of vulnerability, anxiety, and a lack of control.

After a CBRN event there are three groups of psychological responses: distress, behavioral changes, and psychiatric illness. Distress following a CBRN event is common and manifest as sadness, anger, fear, difficulty sleeping, impaired concentration, and disbelief. These symptoms may be amplified if those affected believe something could have been done to prevent the exposure or that concerns raised about exposure were not adequately addressed in a timely manner. Psychological distress after a CBRN incident may also manifest as somatic complaints for which no diagnosis can be found (often referred to as "MIPS" — Multiple Idiopathic Physical Symptoms). These patients should be managed by general healthcare professionals. Some individuals will manifest changes in their behavior such as decreasing travel, staying at home, refusal to send children to school as well as increased smoking and alcohol use.

For the vast majority of people, distress and psychological and behavioral symptoms related to the traumatic event exposure will diminish over time. For others, however, symptoms will persist and affect function at home and work, and may result in psychiatric illness. While Acute Stress Disorder (ASD) and Post-Traumatic Stress Disorder (PTSD) are the disorders most people think of in connection with trauma, major depression, increased substance use, family conflict, and generalized anxiety disorder are also encountered. It is important to remember that people with no prior history of psychiatric illness are vulnerable to psychiatric illness after a CBRN exposure.

Those at high risk of developing psychiatric disorders include:

- Those directly exposed
- Those with existing mental illness
- Those who suffered resource losses and disruption of their social supports after the event

Additional information, including care recommendations, can be found through the Center for the Study of Traumatic Stress.

Pediatrics

(*Adapted from the American Academy of Pediatrics'* Chemical Terrorism and Agents: Disaster Management Resources)

Hospitals and EMS agencies should consult with their respective with Pediatric Emergency Care Coordinators (PECC) during planning efforts to ensure that the needs of pediatric patients are appropriately accounted for during responses to chemical emergencies.

Children have inherent physiologic, developmental and psychological differences that may enhance susceptibility and worsen prognosis after chemical agent exposure. Chemical exposures

warrant expedient and thorough decontamination to limit continued primary and secondary exposure.

Children who are pre-ambulatory or pre-verbal and those who have special needs are less able to evade danger or effectively seek help. Although first responders and others who aim to help children during a suspected chemical terrorism act should protect themselves by wearing personal protective equipment, they should be aware that this unfamiliar garb may frighten children and potentially increase their posttraumatic response to stress. It is also important to evaluate and ensure treatment of children for mental health sequelae after chemical emergencies because these sequelae can develop days to months after the event.

The numerous anatomical, mobility, and physical/mental developmental differences that exist between children and adults require special consderation because they can impact planning not only for physical assets, but also staffing requirements for conducting decontamination procedures. For example, when an event occurs, adults may instinctively initiate action to remove themeselves from a given hazard. However, due to age and mental capacity, that is not typically the case with children, and the inability to extricate themselves from a dangerous environment results in increased potential for contamination and the combined effects of acute and chronic illness.

Decontamination Considerations

(*Adapted from the American Academy of Pediatrics'* Decontamination: Disaster Management Resources)

Whether as a result of an accidental release at a chemical plant, a transportation accident or an intentional terrorist action, the threat of exposure of the public to hazardous chemicals is real. Children are particularly vulnerable to aerosolized biologic or chemical agents because they normally breathe more times per minute than adults, and they would be exposed to larger doses than adults in the same period of time. Children are also more vulnerable to agents that act on or through the skin because their skin is thinner and they have a larger skin surface-to-body mass ratio than adults. Children will require different advanced planning and supplies for decontamination. For example, children, especially young children, are more at risk of hypothermia and therefore require heated water or decontamination conducted in a site more protected from cold environments. Each hospital must have its own system or plan for decontamination, with protocols specific to children.

The following are tips and suggestions for decontaminating children:

- Staff helping with decontamination should receive training on the vulnerabilities of children and how to address these.
- Children should be prioritized before adults within the same decontamination priority group.
- Unless strictly contraindicated due to medical needs, families should undergo decontamination together. Children and parents may become upset if separated from family members during decontamination. Keeping children with their parents or caregivers may reduce psychological stress for all family members and decrease the need for additional assistance from responders or healthcare personnel.
- Children will take more time to disrobe and prepare (emotionally) for decontamination. Parents may fear that the privacy, safety, and welfare of their children are not protected if they are cared for by responders of the opposite gender. Children of certain ages may become more anxious when asked to disrobe, and it is recommended to have both male and female personnel to assist children. A study sponsored by HHS revealed that 99% of

chemical contamination can be eliminated by carefully removing clothes and wiping skin with a paper towel or dry wipe.
- The risk of adverse consequences of water-based decontamination may be greater in children; warming measures will be necessary. The water temperature should be 98◦ to 110◦ F out of tap, and foil/metallic blankets should be used post decontamination for ease of use and disposal.
- Hospital personnel should take care to ensure each child's airway remains open and protected during decontamination.
- Low pressure shower systems should be used to decontaminate children.
- Infants and young children can be slippery when wet and will require a system to ensure their safety (e.g., hand spraying while on a stretcher, in a bassinet, or laundry basket with holes).

Clinician-Patient Communication

Most adults can understand verbal directions and read signage directing them through a decontamination line. Children can be nonverbal at several stages of development and lack the ability to read or understand directions. To help mitigate confusion, personnel should develop and use age-appropriate signage (e.g., pictograms) and work to ensure team members speak slowly and in calm tones. These efforts can help reduce anxiety and incidences of non-compliance (Primary Response Incident Scene Management [PRISM], Vol. 1).

At-Risk Individuals

At-risk individuals are people with access and functional needs (temporary or permanent) that may interfere with their ability to access or receive medical care before, during, or after a disaster or public health emergency. Irrespective of specific diagnosis, status, or label, the term access and functional needs is used to describe a broad set of common and crosscutting access and functional needs.

- Access-based needs require that resources are accessible to all individuals, such as social services, accommodations, information, transportation, medications to maintain health, and so on.
- Function-based needs refer to restrictions or limitations an individual may have that requires assistance before, during, and/or after a disaster or public health emergency.

At-risk individuals may have a number of additional needs that must be considered in planning for, responding to, and recovering from a disaster. The CMIST Framework is a recommended approach for integrating the access and functional needs of these individuals. The CMIST Framework provides a flexible, crosscutting approach for planning to address a broad set of common access and functional needs without having to define a specific diagnosis, status, or label.

- **C**ommunication
  Individuals who speak sign language, who have limited English proficiency (LEP), or who have limited ability to speak, see, hear, or understand
- **M**aintaining Health
  Individuals who may require specific medications, supplies, services, durable medical equipment, electricity for life-maintaining equipment, breastfeeding and infant/childcare, or nutrition, etc.
- **I**ndependence
  Individuals who cannot function independently with assistance from mobility devices or assistive technology, vision and communication aids, services animals, etc.

- **S**upport and **S**afety
  Some individuals may become separated from caregivers and need additional personal care assistance; experience higher levels of distress and need support for anxiety, psychological, or behavioral health needs; or require a trauma-informed approach or support for personal safety.
- **T**ransportation
  Individuals who lack access to personal transportation, are unable to drive due to decreased or impaired mobility that may come with age and/or disability, temporary conditions, injury, or legal restriction.

Decontamination Considerations

(*Adapted from* Optimization through Research of Chemical Incident Decontamination Systems [ORCHIDS]: Work Package 9: Systematic Review of the Needs of Vulnerable and Minority Groups in Emergency Decontamination)

Pregnant People

The first recommendation which can be made regarding pregnant women and decontamination is that emergency responders be trained to ask all women between the ages of 10-50 if they are pregnant. Fetuses are most susceptible to the effects of chemical and radiological agents during the first trimester of pregnancy. This is the stage during which pregnancy is most likely to be invisible to emergency responders, so it is imperative that women are questioned about pregnancy prior to undergoing decontamination.

It may be necessary for pregnant women to be decontaminated before other groups, due to their increased likelihood of experiencing negative effects from chemical agents. By decontaminating pregnant women as a priority, negative effects such as those outlined above could potentially be avoided, or at least reduced.

In addition to reducing physical harm to the pregnant women and her fetus, the decontamination of pregnant women before other groups could also reduce the amount of stress experienced by the woman, a factor which has been shown to lead to negative birth outcomes. A further way in which stress could potentially be reduced for pregnant women during decontamination incidents is by emergency responders providing increased reassurance and information. Information provided to pregnant women during a decontamination incident should therefore contain specifics about how decontamination will reduce harm to the fetus, and should also contain any available information on how any medical countermeasures (e.g., antidotes) might affect the fetus.

Medical Devices

As long as a device is non-porous and non-motorized, it is suitable for going through the decontamination process and is capable of being effectively cleaned to reduce risk of secondary contamination. This includes devices such as walkers, canes, some wheelchairs, and prosthetic devices that lack leather components. It does not include anything constructed of porous material, motorized, or relying on a battery source for power, such as hearing aids. In these instances, it will be necessary to make arrangements for an alternative or replacement devices once the patient completes decontamination.

People with Physical Impairments

One of the simplest recommendations relating to the provision of assistance to individuals with physical impairments is that decontamination personnel should ask these individuals about any physical limitations that they have, and the help that they may require to move from place to

place within the decontamination system. It is likely that they themselves will be the greatest experts on their abilities and requirements.

Physical therapists may be helpful in assisting these individuals through the decontamination process, and should be considered when establishing hospital decontamination teams.

Any casualties who are able to walk independently should be processed through the normal ambulatory decontamination line. Thus, only those physically impaired individuals who are reliant on mobility aids or other people to move about should be processed through the non-ambulatory line.

While it is often necessary to remove an individual's mobility equipment from them so that they are able to safely undergo decontamination showering through the non-ambulatory line, their equipment (or replacement) should be returned to them as soon as possible after decontaminating so they can resume independence.

When possible, families should be decontaminated together. In addition to decontaminating families as a unit, the efficacy of the decontamination process would likely be enhanced if people with physical impairments were assisted by and underwent decontamination together with people they knew. Although this may only benefit individuals able to undergo ambulatory decontamination, it is likely that the ease and effectiveness of decontamination for this group would be significantly enhanced.

Plastic chairs should be considered for placement in the disrobing, showering, and re-robing areas; these should be decontaminated between use by different individuals.

People with Sensory Impairments

People with sensory impairments are often reliant on assistive devices (such as corrective lenses, white canes or hearing aids) or service animals to maintain their functional independence. Because of this reliance it is imperative that wherever possible, people do not become separated from these devices or animals and that, if separation is necessary, reunification is achieved quickly where possible.

With regard to the decontamination of **service animals**, it is recommended that service animals should go through the decontamination process with their owner or handler. Furthermore, it may be beneficial to decontaminate the service animal in an area where other people are not simultaneously being decontaminated – this will avoid any problems that may arise if the animal reacts in an unexpected way. Although the benefits of this recommendation are clear, the impact that this would have on the rate of flow of casualties through the decontamination process is not addressed in the document. If it is necessary for a member of decontamination personnel to take charge of a service dog, the animal should be held by its leash (not by its harness) and it should not be petted unless its owner indicates that it is okay to do so.

Given the problems that people with sensory impairment are likely to have if information is conveyed using only one medium in an emergency situation, it is important that information is provided in more than one form. The use of broad gestures such as pointing to the next part of the decontamination process and mimicking washing actions would help not only people with hearing impairments, but also people who find it difficult to hear the instructions given by personnel because of the personal protective equipment that they are wearing.

Any signposts or information sheets displayed during the decontamination process must be large and easy to see.

When providing assistance to an individual with a **visual impairment**, the individual should always be asked what assistance is required. If required, the individual should then be offered an arm which can be grasped lightly for guidance. It is suggested that in some cases the individual may choose to walk slightly behind his or her guider in order that they are able to gauge the reaction that is exhibited toward obstacles. In any case, all obstacles or potential hazards such as stairs, doorways, ramps, etc. should be mentioned. When guiding a person to a seat, their hand should be placed on the back of the chair and when guiding more than one person with a visual impairment, each person should be asked to guide the person behind them.

People with Cognitive Impairments

Individuals with cognitive impairments should be approached from the front, personnel should identify themselves and make eye contact, pointing and touching should be avoided, communication should be kept simple and speech should be slow, the individual should not be spoken down to or shouted at, and attention should be paid to the individual's body language.

If the individual makes claims regarding delusions or false beliefs, these should not be argued with; rather, it is best to simply listen and show understanding. Finally, every effort should be made to keep the person calm and reassured. These suggestions are likely to reduce the anxiety that is experienced and to increase compliance with decontamination instructions.

When interacting with people with autism during emergencies it is suggested that emergency responders should speak slowly, use simple language, repeat or rephrase instructions or information if required, allow extra time for a response to be provided, provide encouragement and praise and consider the use of pictures, written commands or sign language. The use of an authoritative tone should be avoided as should unnecessary touching. It is important for emergency responders to recognize that each individual with autism is likely to act and react differently in an emergency situation. In the case of children with autism, parents or caregivers can serve as a useful source of information on how to effectively interact with the child in their care. It may also be helpful to encourage a parent of caregiver to undergo decontamination showering first so that they serve as a role model.

Elderly People

The sensory difficulties that are likely to be experienced by many elderly people necessitate that more than one mode of communication is used to convey all information and instructions provided during the decontamination process (including visual, verbal and Braille instructions). It is recommended that instructions to be conveyed visually should be presented on non-glare material and that they should incorporate pictures to accommodate those with literacy difficulties. Written instructions should be presented in a large font and should be worded simply. These recommendations will help to ensure that elderly people are provided with an information source that they are able to utilize.

To ensure that elderly people who may have difficulties in retaining information as a result of cognitive difficulties are able to follow the required procedures, instructions should be repeated. It is likely that elderly people's understanding will also be enhanced if any information provided during the course of the incident is broken down into specific parts and if older people are given time to digest the information without being hurried.

People with Cultural and Language-Based Vulnerabilities

Given the likely existence of language barriers between responders and casualties of different cultures and ethnic origin, it is essential that efforts are made to provide information and instructions in a format which can be understood. It has been suggested that all information including signage and instructions should be displayed in as many different languages as possible and use universal iconography, and that casualties who speak a different language should be provided with as much information as possible in order to relieve anxiety about the decontamination process.

It may be beneficial to provide interpretation capabilities during the decontamination process in order to ensure the understanding of non-English speakers.

Attachment 1: General References

- Chemical Emergency Considerations for Healthcare Facilities

  This resource can help healthcare facilities prepare for a chemical emergency by providing key information and considerations that can be used for planning and response purposes.

- Primary Response Incident Scene Management: Guidance for the Operational Response to Chemical Incidents

  The Primary Response Incident Scene Management (PRISM) series is comprised of three volumes that can help ensure that patients exposed to potentially hazardous chemicals receive the most effective treatment possible during the initial stages of an incident (after prompt decontamination). Updated in 2019, PRISM incorporates new scientific evidence on emergency self-decontamination, hair decontamination, the interactions of chemicals with hair, and the effects of a combined decontamination strategy referred to as the "triple protocol." The clinical research showed that these three steps, taken together, remove 99.9 percent of chemical contamination.

- Proposed Minimum Decontamination Capabilities for Hospitals in Massachusetts

  This resource was designed to assist hospitals and their response partners with addressing challenges in hospital-based decontamination during all four phases of the emergency management cycle. While each document can be used individually to facilitate improvement, the resources are most effective when used in combination.

- Hazardous Materials Exposure Guide: A Step-by-Step Medical Response Guide

  This quick-reference cardset is intended for use by pre-hospital and hospital personnel and groups the exposure by class rather than agent (corrosives, asphyxiants, cholinergics) for easier initial assessment and treatment. It includes detailed descriptions of patient treatment steps (decontaminate and collect information; treat chemical exposure; collect blood and urine specimens) following hazardous materials exposure.

Attachment 2: Hospital Decontamination Procedures

The following has been adapted from FEMA's Hospital Emergency Response Training for Mass Casualty Incidents training program.

Ambulatory and non-ambulatory decontamination require different processes for patients to follow and different responsibilities of the healthcare responders. The following sections identify the differences between the different processes.

Ambulatory Decontamination

An ambulatory decontamination corridor is established for use by patients who are injured but can move through the ETA without assistance. A separate decontamination corridor is established away from the ETA for patients who have been identified as contaminated but do not need medical attention. OSHA's *Best Practices for First Receivers of Patients of Mass Casualty Incidents Involving Release of Hazardous Substances* provides an excellent guide for decontaminating patients.

- Patients identified as ambulatory during the SALT (or START and JumpSTART, as applicable) protocol triage are sent to the patient registration area. Once registered and given tags, the patients are prioritized according to their injuries. Patients are processed in order by triage status. Some patients may be routed to a holding area to await decontamination; this is especially true in incidents with large numbers of ambulatory patients.
- Symptomatic (showing symptoms of a medical problem) patients are processed before patients who are asymptomatic (not showing symptoms of a medical problem). Patients who cannot be processed immediately through the decontamination line are sent to a designated holding area. Healthcare responders must reassure the patients that they understand their need for help. However, they must also make clear that the patients must be isolated and organized.
- Clear and simple instructions on decontamination should be provided. A decontamination kit is recommended by OSHA for issue to each contaminated individual. The kit is issued at the registration area and stays with the patient as he or she proceeds through the process. It consists of the following: two numbered tags, three plastic bags, soap, and a washcloth.
- When moving to the decontamination line, the lines are separated by gender. Special consideration for families, small children, the elderly, and people with special needs (e.g., visually, mentally, or physically challenged individuals) should be provided. Children should not be separated from a parent, if possible.
- The patient removes all clothes, double- and triple-bagging all items. The clothing bag should be set aside in a secure location. Staff members should be available to assist patients who need help while undressing. Patients should be told to remove all clothing. The triage tag remains on the patient through the decontamination and treatment process. If staff are available, patients' names and triage tag numbers should be recorded on the decontamination record. Patients should avoid touching the outer layers of the clothing while removing them.
    - Patients should not allow the clothing to come in contact with their face, which will reduce the spread of contamination.

- Depending on the contaminant, dry decontamination may be indicated. Some patients may be able to perform this on themselves with appropriate guidance. Using a blot and rub motion, start with the head (hair), face, then the hands, then any other exposed skin areas. If availability of material permits, instruct patients to use clean swatches of absorbent material for each body area. Above all, ensure that patients do not re-use material after decontaminating their hair. Encourage patients to repeat the entire process several times, paying particular attention to the hair, face, and hands.
- The next step in the process is wash down, which can consist of a cold-water rinse followed by a warm water wash and rinse. However, one can combine the process into a single warm water wash if facilities are not available for separate stations. The cold-water rinse removes gross contamination before the patient begins scrubbing the skin. This reduces the possibility of scrubbing contamination into the skin's pores.
    - A member of the decontamination team should closely observe each patient to ensure he or she is thorough in washing himself or herself. Size of the facility and number of casualties will determine the decontamination areas needed.
    - Performing a cold-water rinse followed by a wash and rinse also allows for faster processing of patients. At the warm water washing station, patients must wash for five minutes if the chemical is nonpersistent or eight minutes if the chemical is unknown or persistent. Decontamination soap, washcloths, brushes, and sponges should be put into a nearby trashcan and not carried into the noncontaminated zone.
- The wash is followed by movement to the survey and monitoring area where patients are checked by a staff member. Clean patients are sent to the dressing area, while those with contamination residue are sent back to the shower. In the dressing area, patients will dress in hospital-provided clothes and proceed into the ED for further care. Provided clothing would normally be a hospital gown, but other modest coverings will suffice.

Decontamination team members should be alert to the possibility that an ambulatory patient may clinically deteriorate and require immediate removal to the non-ambulatory sector via backboard, stretcher, or wheelchair.

Non-ambulatory Decontamination

Non-ambulatory patient decontamination requires more time and staff since a non-ambulatory patient cannot assist in decontamination. Special considerations must be given when decontaminating a non-ambulatory patient.

Non-ambulatory patients are moved to the decontamination area where each is then attended by a minimum of three team members as he or she is moved through the decontamination corridor. The procedure for non-ambulatory decontamination is as follows:

- Place the patient on a backboard or EMS gurney with the pad removed. Removing the pad ensures that contamination will not spread to the padding where it is very difficult or impossible to remove.
- Staff members remove the patient's clothing and valuables and bag those items with an identification tag. Particular attention should be paid to minimizing the aerosolization of contamination by folding the patients clothing inside out as it is removed. Clothing should be cut away as necessary. The procedure for cutting away the clothing is as follows:
    1. Place the patient (on the backboard) between buckets containing soapy water
    2. One or, ideally, two healthcare responders will cut the clothing, while one responder maintains the patient's airway, and controls the operation. Another responder will

communicate any change in the condition of the patient and provide support as needed.

3. To avoid cross contamination, healthcare responders should not straddle patients or kneel on the floor
4. Decontaminate scissors and gloves after each cut and before touching skin.
5. Because most serious injuries and death from contamination with a hazardous material result from airway and breathing problems, remove clothing nearest the airway first.
6. Remove the shirt by cutting up the front to the neck area, and then cut the sleeves to the neck area. Peel the shirt back from the patient and use the inside of the shirt as a barrier for the patient. If present, remove the bra.
7. Remove pants starting at the cuff. A cut is made upward from the bottom of both legs to the waist. Peel the pants away from the patient and use the inside of the pants as a barrier for the patient; remove underwear.
8. Cut shoestrings and remove the shoes. Use the inside of the shoe as a barrier for the patient's foot.
9. Remove the socks by gently pulling up on the sock. If a sock does not pull off, use shears to cut a small hole in the sock's toe and cut up to remove the sock.

- After the clothing has been removed, perform dry decontamination using absorbent material. Using a blot and rub motion, start with the head (hair), face, then the hands, then any other exposed skin areas. If availability of material permits, instruct patients to use clean swatches of absorbent material for each body area. Above all, ensure that patients do not re-use material after decontaminating their hair. Repeat the entire process several times, paying particular attention to the hair, face, and hands.
- If indicated, the patient is moved to the wash station. The first step is a quick rinse from head-to-toe with free-flowing water. A well-wrung out sponge is used to wipe the patient's face from nose to ear. A team member on each side of the patient performs this procedure. Be careful not to allow water into the patient's mouth.
- After a quick rinse, wash the patient with soap and water for five to eight minutes. Use soap and warm water (or appropriate decontaminant based on local protocols) to decontaminate non-ambulatory patients. The patient's airway is cleaned first, followed by all open wounds and, finally, the remainder of the body. Healthcare responders should concentrate on cleaning all the patient's body. Pay strict attention to all body orifices. Dressings and bandages must be removed.
- Decontamination team members should be alert to the probability that the non-ambulatory patient may require airway support and administration of lifesaving antidote administration by intramuscular (IM) injection. If IV therapy is needed, the extremity site for the IV should be decontaminated before the IV is started. If IV therapy is needed, the patient should be pulled out of line in the decontamination corridor but remain in the decontamination sector. This will require dedicated medical personnel in addition to decontamination line staff.
- Once decontamination is complete, the patient is transferred to a clean backboard, dressed in hospital garb, and triaged for further treatment. Make note that all medical treatment items including bandages, backboard, collar, and ventilation equipment must be decontaminated or replaced with clean materials before the patient can be transported.

Access and Functional Needs

Patients with access and functional needs (e.g., those who are handicapped, sensory impaired, or cognitively impaired; children or infants; elderly; those with service animals or pets; or non-English speaking) may slow down the decontamination process. Instructions should be

multilingual and easy to understand. Signs should be in large print. Handrails, shower chairs, and walkers assist patients with mobility issues.

The hospital decontamination team may want to consider a designated area in the ETA with temperature-controlled water and nonirritating soap for decontaminating **service animals**. While this area should be separate from the general population being decontaminated, service animals may need to be decontaminated with their owners.
Contact lenses should be removed and placed in the personal property bag. Contact lenses cannot be worn during decontamination. Eyeglasses should be placed in the personal property bag if the patient can see sufficiently to continue through the decontamination line. If not, the glasses must be decontaminated thoroughly.

Patients who use **walking assistance devices** may retain them, but the device must be washed with soap and water during the decontamination process before being allowed into the transport or treatment sector. Patients who are unsteady standing or walking should be given a walker upon entry into the decontamination corridor. The walker should be used to assist with ambulation until victims get to the end of the line when it should be retrieved, decontaminated, and returned to the front of the decontamination corridor for the next patient who needs it.

Hearing aids cannot be immersed or otherwise soaked with water. They should, therefore, either be removed and placed in the valuables portion of the patient's clothing bag. If they must be used by the patient they should be carefully wiped with a saline-moistened 4x4 gauze, dried, placed into a clear plastic bag, and handed to the patient. The cleaned hearing aid is not to be worn until the patient has completed the decontamination process (including washing the ears) and is in the transport or treatment sector.

Unless the oral cavity is contaminated, **dentures** should remain in place and no decontamination is necessary. If the oral cavity is contaminated, then the dentures should be removed, placed in a clear plastic bag with the patient's name or triage tag number placed on it. The dentures should later be decontaminated in accordance with instructions received from the poison center and/or a dentist. The patient's mouth should be decontaminated with mouthwash or saline that is gargled and safely spit out into a biohazard bag. Note that, depending on the contaminant, it may not be possible to decontaminate plastic items, such as dentures.

Special considerations for the decontamination of children could include issues such as the following:

- The decontamination should include handheld carriers for decontamination of infants.
- Bathtub toys to comfort small children.
- Child-friendly stickers on PPE to reduce fear.
- Special areas for decontamination of families to avoid separation.
- Children may also require immediate decontamination or a more thorough decontamination.
    - Children may react differently to chemicals than adults and may be more vulnerable because of relatively higher per minute ventilation per kilogram.
    - Children also have a relatively larger surface area to body weight ratio, making them more vulnerable to skin hazards.

Law Enforcement Officers with Weapons

In most cases, law enforcement officers who have been injured on scene will have had their gun(s) removed and given to a fellow officer before arrival. However, if that is not the case, the weapon should be left in the holster and the gun belt removed by a decontamination team

member and placed in a clear plastic bag labeled with the patient's name and/or triage tag number. The bag should then be passed to the treatment sector where it should be given to a fellow officer or hospital security officer for safekeeping until it can be given to a representative of the injured officer's department.

The gun should be left in the holster, if possible. If the gun must be removed, it should be handled by a decontamination team member familiar with firearms, rendered safe, placed in a clear plastic bag marked with the patient's name and/or triage tag number, and given to a fellow officer or hospital security officer in the treatment sector.

Decontamination team personnel should be aware that an officer may have a backup weapon usually found in a holster near the ankle, in his or her pocket, in a ballistic vest, or near an armpit. The holster with the weapon in place should be removed and secured as described above. An officer's gun belt may also contain items that could prove dangerous if in the wrong hands.

The belt should be collected and separately bagged and passed to a fellow officer or hospital security officer in the treatment sector. Decontamination of an officer's weapon and/or gun belt will be the responsibility of the police department.

If the officer is wearing a ballistic vest, it must be removed prior to undergoing decontamination. The vest is usually easily removed by loosening the Velcro straps, pulling the vest apart, and taking it off the patient. It should then be placed in a large plastic bag.

Technical Decontamination Corridor

Healthcare responders must undergo thorough technical decontamination when their shifts have been completed or when the ETA is being dismantled. The healthcare responder decontamination station is established off to the side of the patient decontamination corridor. This corridor allows for removal and decontamination of PPE and equipment.

The healthcare responder enters the corridor in full PPE and immediately rinses. Care must be taken to not allow water into the filters of the facemask. If water enters the filter, it will clog, and the individual will not be able to breath. After the rinse, the individual moves to the wash station. At this station, an assistant will scrub the outside of the PPE with decontamination solution. After washing, the individual is rinsed at the same station. Finally, the individual moves to a second rinse station where he or she is again rinsed from head to toe.

At the wash and second rinse station, the bottom of the boot is cleaned last, and the individual puts the foot outside the station after which the second boot is cleaned. Once rinsed, the individual can move through the undressing stations of the decontamination corridor for normal doffing of the PPE. Responders are assigned to each station to assist in the decontamination and removal process.

All equipment, cleaning supplies, used equipment, and other items must be either decontaminated or double-bagged and prepared for disposal when the site is no longer needed. Nothing used within the corridor can be allowed out of the area before decontamination.

Attachment 3: Decontamination of Decedent Remains

Table 2. Recommended process for preparation, decontamination, and clearance of nerve and sulfur mustard contaminated remains

Procedural steps	Additional notes/considerations/suggestions	PPE
1. *Prepare remains*. Remove remains from pouch; remove clothes and personal effects (PE). a. Reassess/monitor remains and segregate those assumed/considered most highly contaminated (decontaminate and process last). b. Bag and process PE as contaminated hazards. c. Dispose/destroy empty pouches as contaminated hazards	After appropriate forensic evidence and intelligence documentation and photographing, all porous/nondurable PE should be listed on a certificate of destruction and should be disposed/destroyed as chemical contaminated. "Durable" or nonporous items such as metal identification tags and jewelry can be segregated and decontaminated. (*Note*: Metal identification tags can be decontaminated in place; it is recommended that they be retained with the remains to reduce potential for misidentification.)	*Depending on presumed type of agent and release*: NIOSH levels A and B if VX, liquid agent or extremely high concentrations of contamination. At minimum, NIOSH level C HAZMAT ensemble, boots, rubber gloves, and NIOSH CBRN certified respirator
2. *Source check and initial wash*. a. Examine wounds and remove visible clothing fragments, splinters, shrapnel, projectiles, etc. Any clothing fragments, shrapnel, etc should be decontaminated separately and/or properly disposed to prevent internal retention of agent. b. Gently spray and wash remains* with soapy water and special attention to hair, eyes, mouth, ears, anterior/posterior orifices, and wounds. Avoid vigorous scrubbing and high-pressure spray application; gently rinse with plain water. This procedure is also suitable for durable personal effects. c. Mitigate/control/contain rinse water and decontamination water runoff	Initial soap and water wash will enhance efficacy of decontamination procedure (step 3) by removal of debris, blood and extraneous materials and fluids that would react with, soil, or otherwise dilute and degrade the decontamination solution. Soap and water wash has been demonstrated to be as effective as dilute bleach in removing/degrading nerve agents and sulfur mustard.[63-66] If this initial wash (step 2) is not performed, then more frequent preparation of fresh decontamination solution would be required with consequent production of excessive waste. One percent soap solution effective, and alkaline soaps preferred[66]	Same as above for remains preparation, though consider potential need to address splash (contact) hazard created by decontamination process (such as incorporation of wet-weather gear)
3. *Decontamination solution wash*. a. Refer to Table 3 for contact times. b. Conduct decontamination as per notes in adjacent column. c. Rinse remains thoroughly with plain water and allow them to drain. d. Monitor/augment/change out decontamination solution to maintain strength and pH as needed	If direct "liquid" CWA exposure is confirmed, recommend that remains be fully immersed in decontamination solution within a soak tank† or similar. Placement of remains on a platform or in a mesh basket of neutral or negative buoyancy will facilitate full immersion, as will use of weights. Rinse water requirements ~5.0 gal per whole-body remains for one individual. Remains exposed only to agent vapor are less likely to require immersion in decontamination solution. Mitigate rinse water and decontamination water runoff. Options to ensure appropriate decontamination solution strength/pH: use of chlorine and pH monitors to monitor decontamination solution strength and pH; change out decontamination solution and replace with fresh after processing 10 sets of remains[67]; visual monitoring of decontaminating solution color, etc. Remains that are in a fragmentary condition require special treatment.* Military charcoal filters (as, in masks) provide adequate	Same as for step 2

Table 2. Recommended process for preparation, decontamination, and clearance of nerve and sulfur mustard contaminated remains (continued)

Procedural steps	Additional notes/considerations/suggestions	PPE
	protection against chlorine vapors released from tanks containing decontamination solutions for ~500 h; the capacity to adsorb nerve agent or sulfur mustard vapors is not reduced by exposure to chlorine vapors.[67] Recommend respiratory filter replacement before 500 h have elapsed	
4. *Post-decontamination preparation*. a. Place remains in a clean human remains pouch and close. b. Wash body bag/pouch exterior with 1-2 percent hypochlorite decontamination solution and rinse. c. Move bag/pouch to designated quality control holding area for verification (clearance monitoring). Once in designated verification/quality control area, allow remains in bags/pouches to equilibrate before off-gas clearance monitoring (see step 5)	Designated quality control holding area for the decontaminated remains in body bag/pouch should be somewhat temperature/environmentally controlled; recommend an ambient temperature range between 21 ± 5.5°C (70 ± 10°F) and 32 ± 5.5°C (90 ± 10°F) to promote off-gas (in line with existing US protocols for clearance of decontaminated items/materiel).[68] Recommend minimum equilibration time of 15 min for decontaminated remains (a longer holding time such as up to 4 h may be necessary if supralethal dose of liquid VX was involved or suspected). Use of duct tape to seal pouch zippers is a reasonable precaution[69]	NIOSH level C HAZMAT ensemble, boots, rubber gloves, and NIOSH CBRN certified respirator
5. *Quality control/clearance monitoring*. a. Use field monitoring/analytical equipment to verify that decontamination hazard has been mitigated to below the associated effective or clearance concentrations outlined in Table 4. b. If clearance monitoring fails, repeat decontamination procedures and certification monitoring procedure until successful	Recommend that monitor/probe be placed in body bag/pouch within 2.5 cm (1 in) from surface of remains. To avoid probe contamination, do not allow probe to contact remains. Sample at three locations in pouch: head, torso, foot. Nondetects in samples with equipment calibrated to achieve necessary clearance decontamination ranges identified in Table 4 are satisfactory to verify that chemical-specific hazard has been mitigated	Wear mask, surgical gloves (alternative to butyl rubber gloves), NIOSH level C, and NIOSH CBRN respirator
6. *Post-quality control/clearance*. a. After successful quality control and clearance monitoring, transfer pouch to the final clean area for processing as normal human remains.‡ b. Appropriate statement can be made that remains no longer pose a hazard (such as in ref. 70)	Although this multistage process is considered adequate and appropriate to clear remains resulting from the current plausible agent threat scenarios, data indicate that if *supralethal concentrations of liquid VX* agent were involved, some additional precautions (eg, extended holding times and/or temperatures) may be needed	NIOSH level D; no HAZMAT PPE necessary; only routine BBP precautions as appropriate

*Fragmentary remains require special treatment (small-gauge mesh container immersion in soapy water solution and rinse with plain water); use separate wash solution than for intact remains.

†*Note*: It is noted that use of a soak tank may be impractical for decomposing human remains due to potential for sloughing and tissue loss. It is also noted that soak tank operation is a physically intensive task and increases potential for decontamination solution splash to personnel and their PPE. However, use of soak tank is the most aggressive/thorough form of decontamination and is particularly appropriate if liquid agents, VX and HD, are presumed to have been on remains. An alternative is repeated rinsing (and rinsate capture for disposal), which can enhance potential for tissue damage and cosmetic effects as well as produce excessive waste.

‡As the supralethal liquid VX scenario is extremely unlikely, current guidance is to conduct procedures as described earlier and to contact specialty subject matter experts (eg, CBRN, preventive medicine personnel, or similar) to determine scenario-specific plan of action in the event of significant liquid VX exposure fatalities.