NORTHWEST HEALTHCARE Response Network

Healthcare System Emergency Response Plan

Chemical, Radiation and Nuclear Emergency Surge Annex

Version 2, June 2024

Record of Changes

Version No.	Description of Change	Date Entered	Posted By
1.0	Plan development	June 2023	Vicki Sakata, MD River Hansen
2.0	Chemical update	June 2024	Vicki Sakata, MD

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Introduction

Multiple chemical, radiation and nuclear (CRN) hazards exist within the state of Washington. The state is home to several international port cities and multiple military bases. Mining, manufacturing, a nuclear power plant, research centers and federal nuclear waste storage sites in the state all pose potential CRN hazards. These hazards along with the unfortunate threat of terrorism underline the need for response planning.

A large CRN disaster event requires the coordination of multiple community partners including Fire/Emergency Medical Services (EMS), hospitals, clinics, urgent care centers, long-term care facilities, healthcare coalitions, health departments, emergency management, and other supporting partners. In order to provide the best medical care possible during such an event, preparedness and coordination are key.

The state of Washington has one state designated Level 1 Trauma Center, one American Burn Association (ABA) designated Regional Burn Center and one designated Radiation Injury Treatment Network (RITN) facility. These specialty facilities serve not only the state of WA, but also multiple neighboring states. This further underscores the crucial need for local healthcare facilities to not only prepare for a local CRN event, but also have the capacity to manage surge from neighboring states who do not have specialty care.

The key to managing any type of mass casualty event or medical surge is to ensure all facilities, not only specialty facilities can stabilize and manage all types of patients. Non-specialty facilities must be able to surge and manage potential CRN exposed or contaminated patients.

This Annex provides planning and response guidance for healthcare facilities in the Northwest Healthcare Response Network (NWHRN) service area responding to a large CRN disaster.

Purpose

The NWHRN CRN Emergency Surge Annex provides hazard-specific supplemental guidance to support a coordinated healthcare response to a CRN emergency in which the number and severity of exposed or possibly exposed patients challenges the capability of the healthcare coalition facilities. The annex along with the corresponding CRN Clinical Toolkit will outline specific incident response protocols and treatment guidelines, to properly plan for, manage, and care for patients during a CRN emergency.

The purpose of the CRN Emergency Surge Annex is to:

1. Ensure all healthcare facilities are prepared to respond to a CRN emergency.
2. Describe procedures for activation, communication and coordination among public health, emergency management, healthcare organizations, and all other relevant partners during a CRN response.
3. Define the roles and responsibilities for healthcare facilities, the NWHRN, LHJs, local and regional response agencies including the Washington Medical Control Center (WMCC) and local Disaster Medical Coordination Centers (DMCC), EMS/Fire/HAZMAT, non-governmental, local, state, federal, and tribal partners in a CRN emergency surge response.

4. Link this Annex to appropriate NWHRN plans and Toolkits.

Scope

The CRN Emergency Surge Annex is an operational annex to the larger NWHRN Healthcare Systems Emergency Response Plan (See Appendix B) and is applicable when there is a major CRN emergency. This annex is not applicable for minor chemical, biologic, or radiologic exposures. This annex also does not supersede existing facility, county, regional or state plans and procedures for CRN emergency response.

This annex uses the US Department of Health and Human Services, Radiation Emergency Medical Management definition of a radiologic and a nuclear event. "Radiologic" refers to an incident which involves the dispersal of radioactive material without a nuclear (i.e. fission) detonation. Examples would be a dirty bomb or the distribution of unsealed radioactive material in soil, air or water. "Nuclear" refers to a nuclear (i.e. fission) detonation such as a nuclear bomb, or other improvised nuclear device detonation.

Planning Assumptions

Planning assumptions for this annex include the following:

1. All healthcare, in-patient and out-patient care facilities and EMS/Fire/HAZMAT agencies are expected to maintain individual CRN emergency response and patient surge plans.
2. A CRN emergency may be fast moving, requiring immediate coordination and movement to save lives, or be slow moving, providing ample time for planning and notification.
3. A large event may occur outside of NWHRN service area requiring support from healthcare partners within the coalition. This annex as well as individual partners' response plans will be activated whenever there is an appropriate need independent of the event location.
4. Outside resources to support a CRN emergency surge may be delayed.
5. Specialty care patients (e.g., pediatrics, behavioral health, or critically ill and injured) may need to be cared for at healthcare facilities without specialty care services.
6. In addition to acute care hospitals, receiving facilities could include alternate care facilities or field treatment sites.
7. Patients may arrive by non-traditional means, such as private vehicle, law enforcement, etc., and patients may arrive at healthcare facilities with little to no notice and with little to no clinical information.
8. Routine methods of communications and transportation may be strained and/or disrupted.
9. Depending on the route of delivery, first responders will most likely be the first to detect the presence of CRN material. However, CRN contamination can occur by various routes. The specific chemical, isotope, or dose of radioactive material may not be initially known.
10. A CRN event involving an explosive device may result in traumatic injury independent of the CRN element and trauma care must be taken into consideration.
11. Healthcare facilities may be within the impacted area requiring additional patient movement and surge support.

12. In all CRN responses, safe zones, such as blast, chemical and radiation zones will be established at the primary source. Depending on multiple environmental considerations (i.e. temperature, weather, wind direction), hazard zones may shift. Healthcare will need to be flexible and maintain close communication to coordinate response plans accordingly.
13. All coalition healthcare entities and associated partners will respond to the best of their ability given the situation at hand.

Concept of Operations[1]

A. Activation

- This Annex may be activated during any known or potential CRN event that warrants coordination between one or more healthcare organizations/systems and other emergency response partners. This activation may occur concurrently with the activation of other plans within and/or outside the area.
- A request for activation of this Annex may originate from any local healthcare organization, local and/or state DMCC, WMCC, Local Health Jurisdictions (LHJ), or emergency management agency, WA State DOH, as well as the healthcare coalition.

B. Notification and Warning (See Figure 1)

- Partner emergency coordination operations may activate prior to or following the activation of this Annex. The NWHRN Healthcare Emergency Coordination Center (HECC) will operate in coordination with all other activated local/regional/state coordination centers.
- The HECC may activate prior to or concurrently with the activation of this Annex.
- Following an incident, the local EMS agencies responding will notify the local DMCC, who will then notify the NWHRN and local area hospitals receiving patients.
- The NWHRN will be responsible for notifying SCCA, Bloodworks NW, WA Poison Center, coalition healthcare facilities, LHJs and local emergency operations centers (EOCs), DOH preparedness duty officer, and emergency management.
- Emergency Contact Information (see Appendix A) should be made available at every institution. It is highly recommended that these numbers be tested annually for validation.
- If the Annex is activated to support operations in one county, NWHRN and the activated LHJ will provide situational awareness and communicate with WA State DOH and neighboring jurisdictions as appropriate regarding the situation and the potential need for wider activation.
- If the event requires intra-state patient movement, NWHRN will coordinate with WA State DOH to notify the state DMCC/WMCC to assist with coordination

[1]Note: Operationalizing these concepts is a continuing process. All partners have reviewed and agreed upon the importance of each of these steps. However full capabilities continue to evolve.

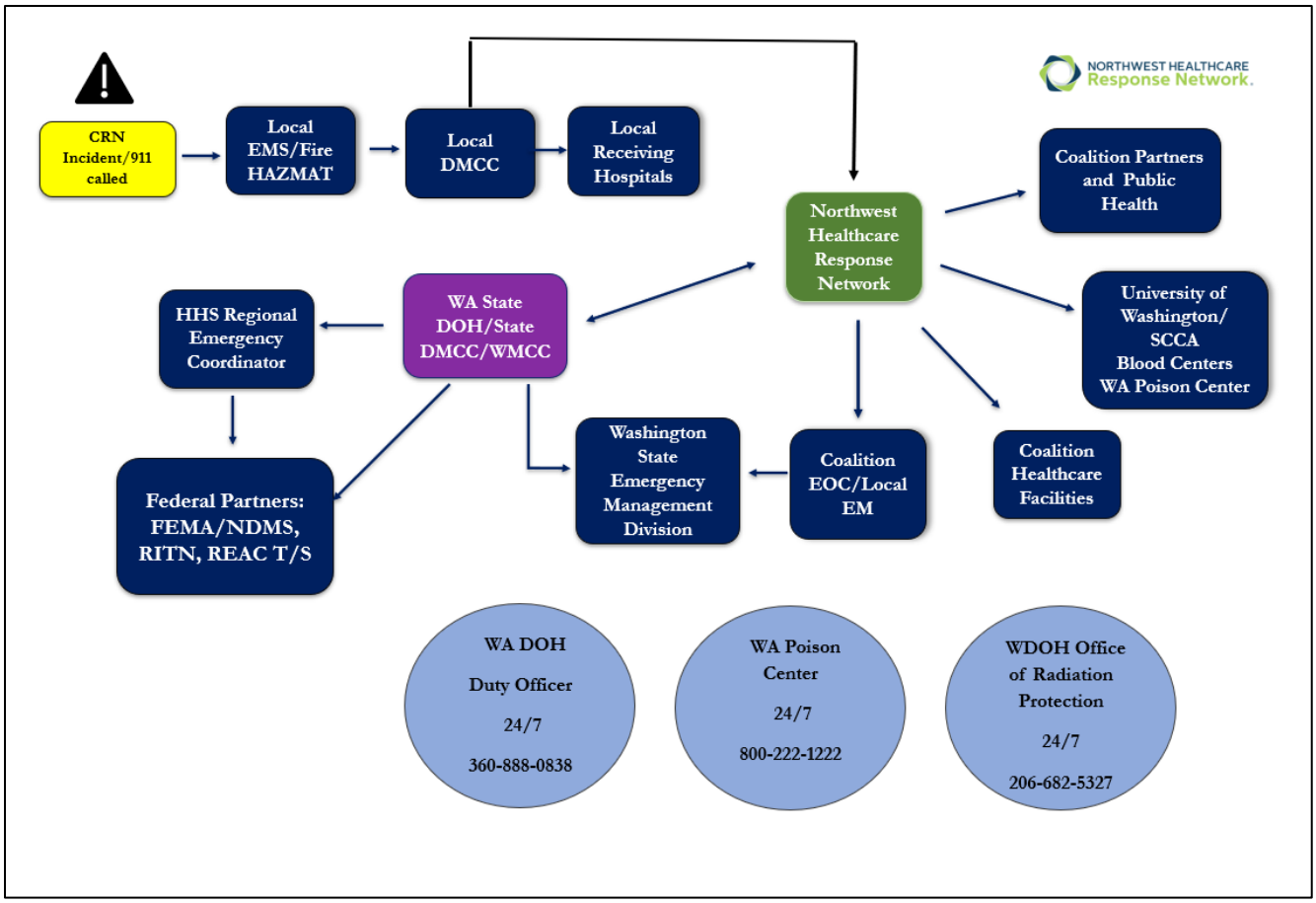


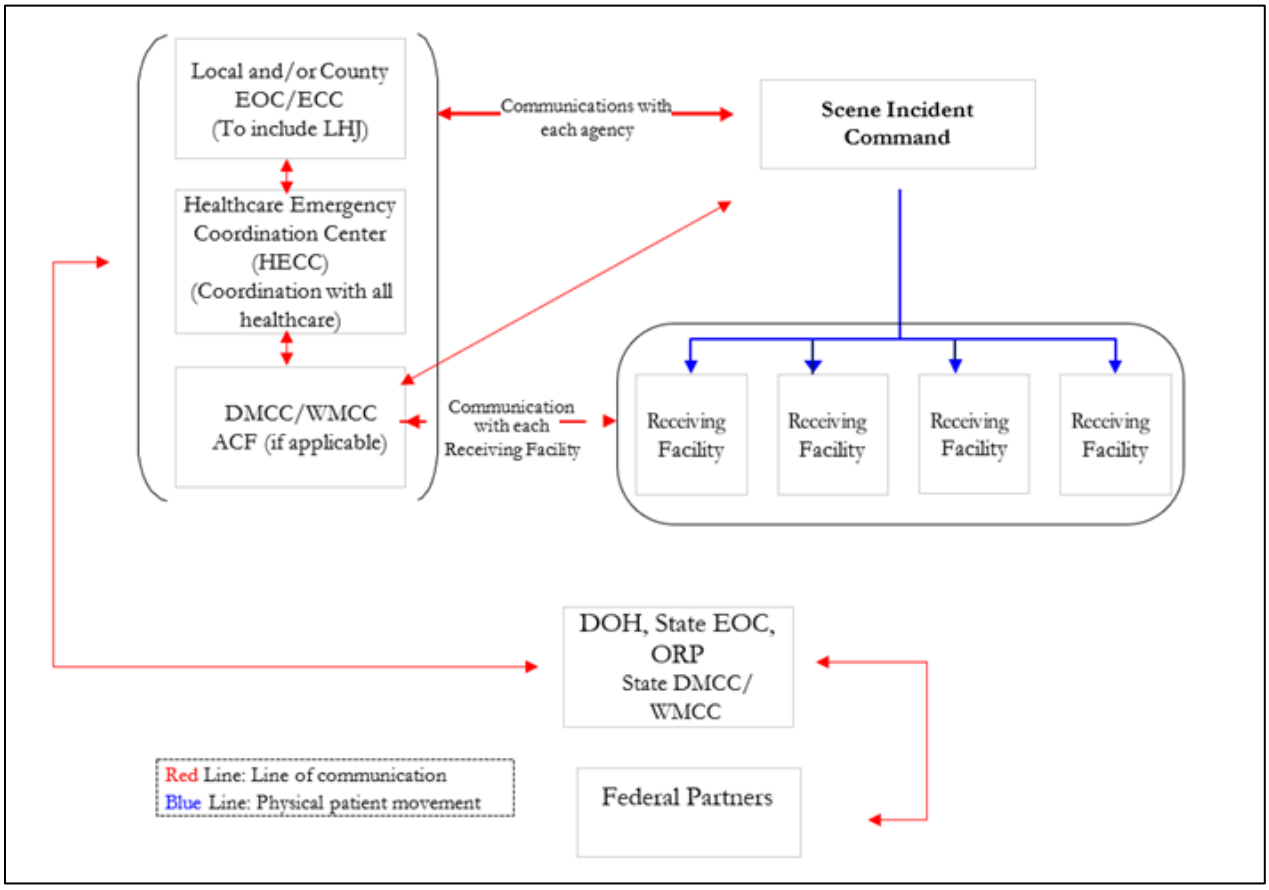
Figure 1: CRN incident notification flowchart

C. Command, Control, and Coordination

- Any major CRN event that requires regional coordination will involve multiple organizations with specific roles and responsibilities. All relevant response entities will activate their incident command structures to support patient movement. The NWHRN, in support of ESF-8, serves as the lead for healthcare preparedness, response, and recovery for its service area.
- During a no-notice event such as a detonation, derailment, or hazardous waste spill, primary response, threat assessment and scene safety are under the direction of Incident Command at the scene.
- When the NWHRN HECC is activated for a CRN event, this Annex will simultaneously be activated with the NWHRN Healthcare Emergency Response Plan to assist in coalition response and coordination. See Appendix B.

- DMCCs will communicate with Incident Command at the scene. Additionally, they will communicate with receiving facilities for placement of patients.
- Additional coordination may be required with neighboring jurisdictions, and relevant regional, state, and/or Federal agencies/organizations.

Figure 2: The following figure illustrates how communication and coordination occurs during a Mass Casualty CRN event.



ii. Intra and Inter-state Coordination for patient movement

- To meet the goal of the best possible patient outcomes after a CRN incident, the state DMCC and/or WMCC will help coordinate intra-state patient transfer and resource sharing. If inter-state or federal assistance is required DOH will assess and follow standard protocols for federal assistance.
- In the case of incoming patients arriving through the Nation Disaster Medical System (NDMS) to a Federal Coordinating Center (FCC) for distribution from an event outside

of the coalition service area, coordination will occur as outlined in the Puget Sound Patient Reception Area (PRA) Operations Plan. (See Appendix C)
    - For a radiation event occurring outside of NWHRN boundaries, if activated, SCCA as a RITN facility will active its Radiation Response Team and will coordinate with state DMCC/WMCC regarding patient triage and placement.
- NWHRN will support coordination and communication between all stakeholders in the event of intra and/or inter-state activation for patient movement, including intra-state patient tracking. (Appendix D: Patient Tracking Appendix)

E. Roles and Responsibilities

1. Primary Organization:

a. Northwest Healthcare Response Network:

- Support mutual aid coordination, resource sharing requests and situational awareness.
- If necessary, initiate and coordinate patient tracking in WATrac to monitor patient location as they are distributed from the incident.
- Provide operational support to the WMCC and local DMCC
- Coordinate information collecting and distribution with local, state, and federal partners.
- Assist with distribution of specialty CRN surge resources, planning tools, and triage protocols needed to assist coalition partner planning.

b. Local Health Jurisdictions (Public Health):

- Maintain awareness of the NWHRN Coalition CRN Surge Annex.
- Activate LHJ plans as indicated and provide public health assistance including but not limited to coordination of information, public messaging, requesting additional jurisdictional assistance, fatality management, and communicating with other stakeholders and the public per response plans.
- Maintain plans and oversee Community Reception Centers and Family Assistance Centers as needed for response.
- Work with supporting agencies for population decontamination, monitoring and public health messaging
- Support and coordinate mutual aid requests as needed.
- Provide EEI and situational awareness as needed to support coordinated response.

c. Local DMCC:

- Maintain awareness of the NWHRN Coalition CRN Surge Annex.
- Notify NWHRN Duty Officer (425-988-2897) for situational awareness during any major CRN event.
- Provide EEI and situational awareness as needed to support coordinated response.
- Triage/prioritize patient movement to specialty centers with assistance from subject matter experts (SME).

d. Emergency Management Agencies:

- Maintain awareness of the NWHRN Coalition CRN Surge Annex.
- Activate as appropriate and implement local plans as indicated given the situation at hand.
- Support local resource requests and the procurement of resources, as well as support mutual aid if needed.

e. Tribal Government

- Maintain awareness of the NWHRN Coalition CRN Surge Annex.
- Activate as appropriate and implement individual plans as indicated given the situation at hand.
- Support local jurisdictions with coordination and requests for assistance as able given the situation at hand.
- Supply EEI and situational awareness as needed to support coordinated response.

f. Hospitals:

- Maintain awareness of the NWHRN Coalition CRN Surge Annex.
- Have and maintain a CRN surge disaster plan, which should include initial stabilization, consultation, and transfer protocols for patients. In the case of a radiation incident, identify a Radiation Safety Officer and have plans to integrate them into incident command structure and response.
- Inventory, monitor and maintain specific antidote availability.
- Supply EEI and situational awareness as needed to support coordinated response.
- Provide patient care to the best of the facility's capabilities prior to transferring patients to a higher level of care if needed.
- Protect and monitor staff.

g. Seattle Cancer Care Alliance (SCCA) RITN Designated Hospital

- Maintain awareness and assist with review of the radiation response sections of the NWHRN CRN Surge Annex and Clinical CRN Response Toolkit.
- Have, maintain, and activate a chemical and/or radiation mass casualty incident radiation surge plan to assist with the coordinated care of radiation exposed patients.

- Provide, maintain, and review clinical guidelines for the triage, stabilization, and transfer protocols for radiation patients.
- Supply EEI and situational awareness as needed to support coordinated response including communication with the state DMCC/WMCC as the situation warrants.
- Support non-RITN facilities providing care for radiation exposed patients in the region via telephone/telemedicine as able given the situation at hand. Assist with requests for Strategic National Stockpile and other federal supplies with appropriate stakeholders as the situation warrants.

h. Washington Poison Center
- Maintain awareness and assist with review of the NWHRN CRN Surge Annex and Clinical CRN Response Toolkit.
- Have, maintain, and activate a CRN mass casualty incident surge plan to assist with the coordinated care of exposed patients.
- Provide, maintain, and review clinical guidelines for the triage, stabilization, and transfer protocols for CRN patients.
- Supply EEI and situational awareness as needed to support coordinated response including communication with local, regional, and state entities as the situation warrants.

h. All facilities with in-patient pediatric capabilities:
- Maintain awareness and assist with review of the NWHRN CRN Surge Annex.
- Have, maintain, and activate a CRN mass casualty incident CRN surge plan to assist with the coordinated care of pediatric CRN exposed patients.
- Provide, maintain, and review clinical guidelines for the triage, stabilization, and transfer protocols for pediatric CRN patients.
- Supply EEI and situational awareness as needed to support coordinated response including communication with the state DMCC/WMCC as the situation warrants.
- Support non-pediatric facilities providing care for CRN exposed pediatric patients in the region via telephone/telemedicine as able given the situation at hand.

i. Emergency Medical Services, Fire/HAZMAT, Law Enforcement
- Maintain awareness of the NWHRN Coalition CRN Surge Annex.
- Have and maintain CRN and HAZMAT decontamination and transportation protocols which should include identifying hazardous exposure, establishing zones of response, stabilization, consultation, and transfer protocols for CRN exposed and injured patients.
- Rescue, transport, and distribute casualties to appropriate local facilities in accordance with established CRN and HAZMAT protocols.
- Supply EEI and situational awareness as needed to support coordinated response, specifically types of hazards as they are identified at the scene.

- Protect and monitor staff.

2. Supporting Organizations:

a. State DMCC/WMCC:

- Maintain awareness of the NWHRN Coalition CRN Surge Annex.
- Support intra and inter-state patient movement and coordination when requested providing coordination between healthcare facilities as well as external out-of-state partners, including but not limited to NDMS, federal partners, RITN designated facilities, etc.
- Ensure the appropriate clinical information is relayed between the referring and receiving facilities during the transfer process.

b. Washington State Department of Health (DOH)/Washington State Emergency Management Division (EMD) and Washington Office of Radiation Protection (ORP)

- Maintain awareness of the NWHRN Coalition CRN Surge Annex.
- Support local jurisdictions with state-level coordination and requests for assistance to include assisting with identification and transfer of CHEMPACKs to remote locations as requested.
- Support and coordinate inter-state transfer of resources.
- Make requests for CRN care assets including materials from outside resources such as the Strategic National Stockpile (SNS) or external User Managed Inventories (UMI) if local resource requests are not fulfilling resource needs.
- Liaise between local, state, and federal resources to provide situational awareness and coordinate response efforts including the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service (NWS) for assistance with wind, weather and environmental factors crucial for CRN event messaging and response.

c. Health & Human Services/Administration for Strategic Preparedness and Response

- Coordinate with DOH when a response exceeds local and state resources.
- Coordinate federal-level resources, requests, and any national resource stockpiles.
- Coordinate state and military partners to support regional medical and non-medical response with resources, personnel, and coordination.
- Provide federal support to local and state activities as requested under the National Response Framework, including supplies, staff, and transportation assistance through the Federal Coordination Center appointed to the State for the incident.
- Coordinate approved use of the National Disaster Medical System.

F. Patient Tracking

The NWHRN administers the DOH Patient Tracking System that provides a framework for accurate patient tracking through an online system (WATrac) and paper-based backup. Patient tracking is a vital element of healthcare situational awareness, operations, and family reunification regionally. The NWHRN has identified core data elements for tracking; processes and protocols to maintain tracking; and critical partners that may need patient tracking information to support operations and family reunification.

During patient movement response, patient care and transport is paramount, but tracking should begin as soon as possible. Please see Appendix D: Patient Tracking Appendix for further details.

G. Logistics - Equipment/Supplies/Staff

Any medical surge will require additional supplies, staff, and equipment. All facilities should maintain CRN surge supplies, specifically, decontamination, PPE and pharmaceutical supplies needed in a CRN response.

- Any additional resources needed should be requested using previously established mutual aid agreements or through standard supply request procedures (See Appendix B)
- Specialty products and staffing needed in a CRN response, to include but not limited to blood products, pharmaceutical supplies, personal radiologic dosimeters, bone marrow transplant teams, will be coordinated with healthcare facilities, blood banks, cellular therapy lab (CTL), NWHRN, DOH, federal assets (if activated) along with all other stakeholders. For chemical antidote specialty products see CHEMPACK Activation below.
- Radiation Response Pharmacy supplies: the following pharmaceuticals will be in demand during a large radiaiton event: Filgrastim, anti-thymocyte-globulin; IV Immunoglobulin, IV Cyclosporine, Vancomycin, Ganciclovir, Levaquin, Ceftazidime, Ceftriaxone, Fluconazole, Acyclovir and Bactrim. University of Washington/SCCA will maintain supplies of these medications, however, shortages and supply chain issues in a large national event should be expected and planned for.
- Strategic National Stockpile (SNS): In the case of a radiation, biologic or chemical event requiring medications that exceed individual facility and regional capabilities the (SNS) Formulary contains treatment for multiple threats to include anthrax,

botulism, typhus as well as others. Request for assistance is done through the usual requesting process as outlined in Appendix B.

1. CHEMPACK Activation

In the event of a widespread chemical nerve agent incident requiring antidote administration that exceeds individual facility and regional capabilities, rapid deployment of the Strategic National Stockpile (SNS) Center for Disease Control (CDC) designated CHEMPACK is critical for an effective response and to save lives.

There are multiple CHEMPACKs pre-positioned in the state of WA with several located within NWHRN service area.

Types of CHEMPACKs:

1. EMS CHEMPACK: Designed for prehospital medical providers, and the antidotes contained in the EMS CHEMPACK are mostly auto-injectors for speed and ease of use.

2. Hospital CHEMPACK: Designed for hospital medical staff, and the antidotes contained in the hospital CHEMPACK are primarily multi-dose vials.

All CHEMPACKs are under quality assurance and oversight of the Administration for Strategic Preparedness and Response's Center for Disease Control Strategic National Stockpile and administered by WA State DOH. Every facility and agency with CHEMPACK control must maintain protocols and procedures for safe storage and maintenance.

The following process is required to activate and distribute CHEMPACK contents:

1. The need for and activation of a CHEMPACK is determined by first line responders including but not limited to EMS, Fire, and/or emergency department personnel. Activation requirements are outlined in the WA State CHEMPACK Plan (pending). The mission of the CHEMPACK program is to save lives. Due to the internal Sensaphone technology within each CHEMPACK, the CDC will be notified automatically when a CHEMPACK is opened.

2. If a responding agency or jurisdiction does not have immediate local access to a CHEMPACK and CHEMPACK delivery is required the facility or agency requesting the CHEMPACK will notify state DOH 24/7 Duty Officer (360-888-0838). DOH will then identify the closest CHEMPACK and arrange for transportation and chain of custody documentation.

2. CHEMPACK contents contain the following medications needed to reverse nerve agent poisonings: atropine, pralidoxime, diazepam and/or midazolam, and sterile water for infusion. The configuration and amount of medication depends on the type of CHEMPACK. In general, the Hospital CHEMPACK is designed to treat approximately 1000 casualties and the EMS CHEMPACK 454 based on the estimates of 30% mild, 40% moderate and 30% severe cases.

a) Medications contained in the CHEMPACK are part of the FDA Shelf-Life Extension program, meaning that the product is tested regularly and if found to be effective the expiration dates are extended. However, each drug vial or auto-injector is not re-labeled to reflect this update. Instead, each CHEMPACK has an associated "Dear Healthcare Provider Letter" issued by SNS and FDA which details product National Drug Code (NDC) number, Lot number and new expiration dates.

3. Once opened the appropriate antidote should be identified and distributed to frontline responders and patient care areas. The specifics indications for and clinical use of the antidote are detailed in the CRN Clinical Toolkit.

H. Operations – Medical Care

CRN response requires multiple clinical considerations which are covered in the NWHRN CRN Annex Clinical Toolkit. This Toolkit provides details regarding triage, decontamination considerations, estimating exposure, use of antidotes, CHEMPACK instructions and patient care treatment, rehabilitation, and follow-up recommendations including a specific section on pediatric care considerations. (See Appendix E)

- Transportation

Facilities should have proper procedures in place to transport patients safely to appropriate facilities. In the event that a local and/or state DMCC and/or WMCC has been activated, transport control will follow established procedures as outlined in the NWHRN Patient Movement Annex (See Appendix F). Incident Command on scene will communicate with the appropriate DMCC to coordinate vehicles and patient destinations. NWHRN will participate in event specific patient movement planning.

If local transport resources have been exhausted including local transport surge plans and MOUs, and/or if patients need to be transported outside of the region/state, transport requests should be made to the state via the local emergency management process based on type of requests.

- Neighboring coalitions
  - Larger incidents that expand beyond the NWHRN coalition service area, may require coordination between multiple coalitions to transport and place patients at appropriate receiving facilities. Emergency Management Assistance Compact (EMAC) and Pacific Northwest Emergency Management Arrangement (PNEMA) support, coordinated through the Washington State EOC.
- Federal patient movement
  - Federal patient movement support can be requested through the Washington State EOC when all local and state-level capabilities have

been exceeded. These include the Federal National Ambulance Contract and the National Disaster Medical System (NDMS). Communications

- Specialty Transfer Consideration – Bone Marrow Transplant (BMT) Transfer Decisions

  In a radiation event, if the number of patient requiring specialty transplant services cannot be managed directly with SCCA/UWMC then SCCA will activate a Clinical BMT Response Team to assist with triage and placement of transplant candidates outside of the SCCA/UWMC facilities. Since a large CRN event will result in multiple patients, the SCCA BMT Response Team and the State DMCC/WMCC will coordinate closely to assure appropriate bed placement.

  SCCA/UWMC will continue to supply direction, consultation and medical advice for the care of those patients not directly treated by UWMC and SCCA.

  For pediatric patients please see "Pediatric and At-Risk Populations" section below

- Fatality Management

  A death due to a CRN event especially if it is an act of terrorism will be under the jurisdiction of the Medical Examiner's Office. Decedents at the scene may be contaminated and managing exposure risk and decedent decontamination will need to be considered. For decedents within healthcare facilities, healthcare organizations should work through their normal channels for the care of the decedent. LHJs and the DOH will coordinate any changes in guidance or reporting associated with deaths due to a CRN event. If healthcare organizations need assistance in coordinating the care of the decedent, local officials will communicate with local mortuary services to provide guidance on protocols and handing.

  Transportation and movement of decedents will come with special considerations such as cross-jurisdictional transportation, evidence collection processing, and specialized decontamination.

- Behavioral Health

  Given the nature and scope of a significant CRN event, it is to be expected that a number of those who witnessed, were injured in, or responded to the event will experience some degree of mental trauma in relation to the incident. This has been clearly demonstrated in the Chernobyl (1986) and more recently, Fukushima (2011) radiation events. CRN emergencies not only carry the mental stress and strain of any disaster response but also have unique and substantial stressors. CRN survivors most at risk for PTSD are those with a history of anxiety disorders (generalized anxiety, panic disorder) or depression. (Wiechman, 2017).

Pediatric patients and their families require specific mental health/behavioral care. Please see Appendix G: NWHRN Pediatric Surge Annex Toolkit, Section 6, or Appendix H: Behavioral Health Scarce Resource Card for patients and staff for more specific information.

- Pediatric and At-Risk Populations

  Included in all disaster planning is the need to plan for the pediatric patient. In any large medical surge, all facilities need to be prepared to care for children. NWHRN has developed a full coalition Pediatric Surge Annex and has multiple tools to assist facilities in developing their own internal response plans. Specific pediatric considerations needed for CRN exposed pediatric patients is included in the NWHRN Clinical CRN Toolkit (Appendix E)

  During a CRN event which includes exposed and/or injured pediatric patients, all facilities with in-patient pediatric capabilities will activate their CRN response plan and assist with coordinating pediatric care.

  Specialty pediatric services may be overwhelmed, and individual facilities may need to care for the pediatric patient for an extended period of time. Support for non-pediatric facilities managing CRN injured or exposed pediatric patients will be provided via telephone/telemedicine resources through local and regional pediatric facilities. In the case of a CRN incident, the SCCA, other RITN facilities or the Radiation Emergency assistance Center/Training Site (REAC/TS) can also serve as clinical resources. Please see Appendix A for contact information.

I. Situational Awareness

The NWHRN will coordinate situational awareness information sharing with healthcare organizations throughout the region during an emergency response. The NWHRN will work with the LHJs on communication to local partners and DOH. The NWHRN will:

- Collect and analyze Essential Elements of Information (EEI)
- Provide healthcare operations status based on EEI to appropriate partners including healthcare, and all other relevant local and state partners.

- Essential Elements of Information, Indicators, and Triggers:
  - Essential Elements of Information Definition: The use of situational awareness to inform a common operating picture for healthcare during an incident or event that requires targeted and strategic data and information gathering from healthcare organizations, LHJs, vendors (situation dependent), and other partners. Questions developed for data and information gathering are based on key decisions that may have to be addressed during an incident or event and will identify clear triggers and indicators that will inform these decisions.
    - Information considered critical for a CRN event would include but not be limited to the number and ages of injured patients, level of exposure and triage

categories, specialty transport criteria, relevant comorbidities, specific specialty patient needs, in particular pediatric patients, CRN-specific staff and/or supplies.

- For more information on EEI, please refer to Appendix I, the NWHRN Situational Awareness Annex.

J. Communications

- **Communication with Public**
  Consistent and concise messaging will be important in a CRN event. All relevant partners should coordinate messaging, including participation in an established Joint Information System (JIS) for the incident.

- **Communication with Families**
  Each facility is responsible for notifying both the patient's family or responsible party and the patient's attending or personal physician of the situation. If the facility is unable to fulfill this responsibility, there may need to be regional coordinated support of family information and notification. In these scenarios, or during an MCI, the LHJs or local emergency management will establish a call center to support the reunification of patients and their families. A full description of these processes and roles and responsibilities can be found in regional family reunification plans (see local jurisdiction family assistance center plans).

Demobilization

Throughout the Annex activation, the HECC, in consultation with applicable partners, will determine the appropriate conditions required to demobilize and deactivate the Annex partially or fully. Demobilization indicators may include:

- The CRN surge healthcare impact from the incident is at a low level sufficient for ending response coordination.
- Partner agencies have deactivated any EOC/ECC and/or emergency response plans.
- The threat of a reoccurrence of a CRN incident or similar events is sufficiently low to not require response coordination.

The HECC, in consultation with any applicable partners, will communicate the deactivation of the Annex to the same partners that received the activation notice. Annex deactivation will likely be communicated by, at a minimum, email or WATrac alerting tools.

Depending on the severity or scope of the incident, the NWHRN will lead and/or participate in an after-action process. If the NWHRN leads an after-action process, results will be communicated and distributed to partners following the completion of the after-action report.

Following demobilization of this annex, additional regional response operations, such as patient tracking, may continue to support family reunification, provide family support services, and support community and healthcare recovery.

The NWHRN will notify all healthcare and emergency management partners of demobilization of this annex.

Recovery

After demobilization and during recovery, the following activities should be completed:

- Return any borrowed assets (i.e., equipment, staff, etc.) with the understanding that additional time may be needed to decontaminate equipment appropriately.
- Debrief participating local, regional, state, and/or federal partners with after-action reports, discuss improvement plans, and create a coordinated approach to incorporating recommendations into future planning.
- Communications concerning payment and reimbursement for the response.
- Communication of any operational activities that need to be revised or continued.

Training and Exercise

Training in roles and responsibilities for all relevant partner agencies will occur following the adoption of the finalized CRN Surge Annex. The NWHRN assesses yearly the training and exercise needs of all coalition partners using a capabilities assessment, which informs the goals and objectives for training and exercising in the years to come.

Exercises of portions of this Annex or attachments, including tabletops and functional exercises, will occur with healthcare organizations, LHJs, emergency management and other relevant stakeholders. All training and exercises will involve post-event evaluations and/or After-Action Reports, which will include Improvement Plans addressing Core Capabilities.

Authorities and Maintenance

Review Process and Annex Update

Sections of this Annex will be updated as needed based on the evolution of planning activities and partnerships or in coordination with Regional Improvement Plans after exercises or real-world incidents.

The Annex will be provided to the LHJs, healthcare organizations, and regional partners for review and input.

Following review, modifications will be made, and a copy will be provided to all regional partners. Healthcare organizations are expected to share the updated plan internally within their appropriate committees and with their leadership.

The NWHRN Board of Directors will be briefed when updates to this Annex are completed.

Maintenance
The Annex will be reviewed every three years or as needed following the process outlined above.

Appendices

Appendix A: Contact Information (see below)

Appendix B: NWHRN Healthcare Emergency Response Plan

Appendix C: NDMS Puget Sound Patient Reception Site (PRS) Operations Plan V4.0 2019 (see attached)

Appendix D: NWHRN Patient Tracking Appendix

Appendix E: NWHRN CRN Clinical Toolkit

Appendix F: Patient Movement Annex

Appendix G: NWHRN Pediatric Surge Annex

Appendix H: Behavioral Health Scarce Resource Card for Patients

Behavioral Health Scarce Resource Card for Staff

Appendix I: Situational Awareness Annex

Appendix A: Contact Information

Name of Institution	Phone number (24/7)
NWHRN Duty Officer	425-988-2897
Seattle Cancer Care Alliance	206-982-3773
DOH Duty Officer	360-888-0838
WA Office of Radiation Protection	206-682-5327
WA Emergency Management Division Operations Officer	800-258-5990
WA Poison Center	800-222-1222
REAC/TS, Oakridge TN	865-576-3131 After hours: 865-576-1005

NORTHWEST HEALTHCARE
Response Network®

CHEMICAL, RADIATION AND NUCLEAR (CRN) CLINICAL TOOLKIT

Version 2, June 2024

NWHRN would like to acknowledge major contribution from the SouthEast Texas Regional Advisory Council Radiological/Nuclear Response Plan 2023

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Introduction

Multiple chemical, radiologic and nuclear hazards exist within the state of Washington. The state is home to several international port cities and multiple military bases. Mining, manufacturing and industry, agriculture, a nuclear power plant, research centers and federal nuclear waste storage sites in the state all pose potential chemical and radiation hazards. This along with the unfortunate threat of nuclear terrorism underlines the need for response planning. A large radiologic or chemical disaster event requires clinicians who are familiar with triage, decontamination, diagnosis, and treatment of patients who have experienced acute radiation or chemical exposure.

This Chemical, Radiation and Nuclear (CRN) Annex Clinical Toolkit provides basic guidelines and references for facilities to use as a framework when developing their individual chemical and radiation response plans. All healthcare facilities should plan and prepare for chemical and radiation exposure and response. The extent and type of clinical training needed at each facility depends upon the facility capability. However, in a large event, every facility will be required to know the basics of triage, decontamination, radiation and chemical safety measures, and stabilization. Individual sections of this toolkit will address each of these concepts and provide resources for further information as well as just-in-time training.

It is only through planning and preparation that our communities can be assured of receiving the best care possibility during a response event.

Note: This clinical toolkit and corresponding NWHRN Chemical, Radiation and Nuclear Emergency Surge annex uses the US Department of Health and Human Services, Radiation Emergency Medical Management definition of radiologic versus a nuclear event. "Radiologic" refers to an incident which involves the dispersal of radioactive material without a nuclear (i.e. fission) detonation. Examples would be a dirty bomb or the distribution of unsealed radioactive material in soil, air or water. "Nuclear" refers to a nuclear (i.e. fission) detonation such as a nuclear bomb, or other improvised nuclear device detonation. The clinical consideration for radiation exposure and treatment remain the same independent of the delivery method, of course, recognizing that a nuclear detonation will most likely result in a greater mortality and increased general trauma considerations. This toolkit focuses only on the radiation aspect of clinical care and is not intended to be a general trauma resource.

RADIATION EVENT:

Types of Exposures

Ionizing radiation exposures may be categorized as follows:

- Large radiation exposures, such as a nuclear weapon or catastrophic damage to a nuclear power plant.
- Small radiation sources emitting continuous gamma radiation, producing chronic intermittent exposures, such as those found from medical treatments or industrial devices.
- Skin contamination (external contamination) with radiological material.
- Internal radiation (internal contamination) from absorbed, inhaled, or ingested radioactive materials.

Types of radiation injuries include damage from exposure to external radiation; internal radiation from ingested or inhaled radioactivity; and surface radioactivity contamination by liquids and dust, both with and without surface wounds.

Rapid response to a radiological-related event requires prompt identification and treatment. Because of the rapid progression of illness and potential for dissemination of some of the contaminant's agents, it may not be practical to await definitive isotope confirmation. Instead, it will be necessary to initiate a response based on the recognition of presenting syndromes. Each of the types of radiation particles are listed in this toolkit which includes a description and the typical combination of clinical features of the specific particle exposure, which should alert healthcare practitioners to the possibility of a radiological-related event.

Hospital Preparedness

As has been demonstrated at numerous mass casualty events, many victims of an acute, man-made event (such as an active shooter or terrorist attack) will arrive at area hospitals by private vehicle and therefore not be decontaminated. Therefore, hospitals must be prepared to have the necessary equipment and trained personnel to provide gross decontamination on site. When radiation or other hazardous material is expected, the appropriate Personal Protective Equipment (PPE) must be used to protect healthcare workers. General PPE recommendations can be found here. However, every facility should have a designated Radiation Safety Officer (RSO) or access to a Subject Matter Expert (SME) to provide emergency recommendations for patient care and safety.

EVERY FACILITY SHOULD HAVE A DESIGNATED RADIATION SAFETY OFFICER (RSO) OR ACCESS TO A SUBJECT MATTER EXPERT (SME) TO PROVIDE EMERGENCY RECOMMENDATIONS FOR PATIENT CARE AND SAFETY.

Contact information for local, state, and national expertise is available here.

Hazard Assessment

Cross-contamination of hospital staff and/or facilities may pose a threat when responding to a radiological disaster. Healthcare facilities should consider employing the following mechanisms to ensure safety of the staff and patients upon recognition or alert of a potential radiological event:

a. Plan for a Radiation Safety Officer (RSO)

b. Anticipate number, acuity, and potential needs of incoming patients (i.e.: medications, treatment modalities, fluid, oxygen, ventilators, etc.).

c. Decompress current patient load in Emergency Department

d. Formulate plan for decontamination as needed

e. Formulate plan for additional surge capacity.

f. Plan for large numbers of “self-presenters”

g. Notify Security to assist in securing perimeter and access into facilities.

h. Activate internal and external communications plan for both staff and public messaging. Coordinate all public messaging with NWHRN, LHJ, and all other relevant partners

i. Utilize applicable PPE as determined by RSO.

j. Anticipate and cooperate with outside investigating agencies if event is related to an actual or perceived terror attack.

k. Ensure staff protection and safety first. Immediately report all adverse reactions by staff to immediate supervisor.

All patients suspected of radiation exposure will be treated appropriately as per Radiation Safety Officer. In the event of a nuclear mass casualty incident (MCI), depending on the clinical status of the patient, decontamination can occur prior or after initial stabilization and treatment. Life saving procedures should NOT be delayed for decontamination. As with all standard MCI protocols patients will be triaged as Immediate (RED), Delayed (YELLOW), Minor (GREEN) or Expected (STRIPED). “Immediate” triaged patients in need of life-saving interventions can be decontaminated after stabilization. All other patients should be assessed and decontaminated as appropriate. Over 90% of contamination can be removed by removing patient’s clothing and dry decontamination.

LIFE SAVING PROCEDURES SHOULD NOT BE DELAYED FOR DECONTAMINATION.

OVER 90% OF CONTAMINATION CAN BE ELIMINATED BY REMOVING PATIENT’S CLOTHING.

Clinical Findings

Acute radiation syndrome follows a predictable pattern after substantial exposure or a catastrophic event. Specific syndromes of concern, especially when presented with a 2–3-week prior history of nausea and vomiting, include the following:

- Thermal burn-like skin lesions without documented heat exposure
- Immunological dysfunction with secondary infections
- A tendency to bleed
- Bone marrow suppression
- Hair loss

Decontamination:

All facilities should have decontamination procedures and plans in place to include managing nuclear contamination. Multiple resources are available to assist in planning. Radiation exposure does not automatically imply the need for decontamination. As an example: obtaining an x-ray, CT scan or fluoroscopic procedure does not cause the patient to be radioactive and require decontamination. However, exposed patients with external contamination (i.e., open wounds, dust, debris, shrapnel etc.) require decontamination.

RADIATION EXPOSURE DOES NOT AUTOMATICALLY IMPLY THE NEED FOR DECONTAMINATION.

Note 1: Careful removal of patient's clothing will remove most of the external contamination. If clothing is grossly contaminated, moistening the clothing prior to removal will decrease the amount of possible airborne shedding of the material.

Note 2: Follow all recommendations of local, state, or federal officials regarding evidence collection. At minimum secure all patient items in a sealable plastic bag or container and carefully identify each bag with patient's name, date of birth, date, and time of recovery. Placing a hospital medical record sticker if available is sufficient. To protect chain of evidence, any evidence should be kept secure with limited and controlled access.

Internal contamination: The individual has been involved in a radiological/nuclear incident and subsequent contamination results from inhalation or ingestion of radioactive material. While this patient is usually not an external hazard to personnel, other patients, or the environment; you must consider the possibility of external contamination of skin, hair and clothing with inhalation of radioactive material. This patient may require external decontamination.

Monitoring and Decontamination Considerations

Three basic principles limit the radiation exposure to healthcare personnel, staff members, and patients:

- **Time**
- **Distance**
- **Shielding**

The exposure to a beam of radiation does not contaminate an individual. Patient contamination results from contact with radioactive particles that may arise from an explosion or a breach of a radioactive source. Treating individuals before decontamination may result in contamination of the facility. If the patient presents with no life-threatening injuries, decontaminate before treating. If the patient presents with life-threatening injuries, treat the life-threatening injuries, then decontaminate. To minimize the spread of contamination, wrap the patient in a clean sheet prior to bringing into the facility. (Guidelines for care of the radiological contaminated patient in the Operating Room and guidelines for care of a radiological contaminated patient in the hospital are outlined later in this toolkit.)

Evaluation of the extent and degree of contamination must be done prior to and following the decontamination process. Adequate records of contamination and decontamination must be kept.

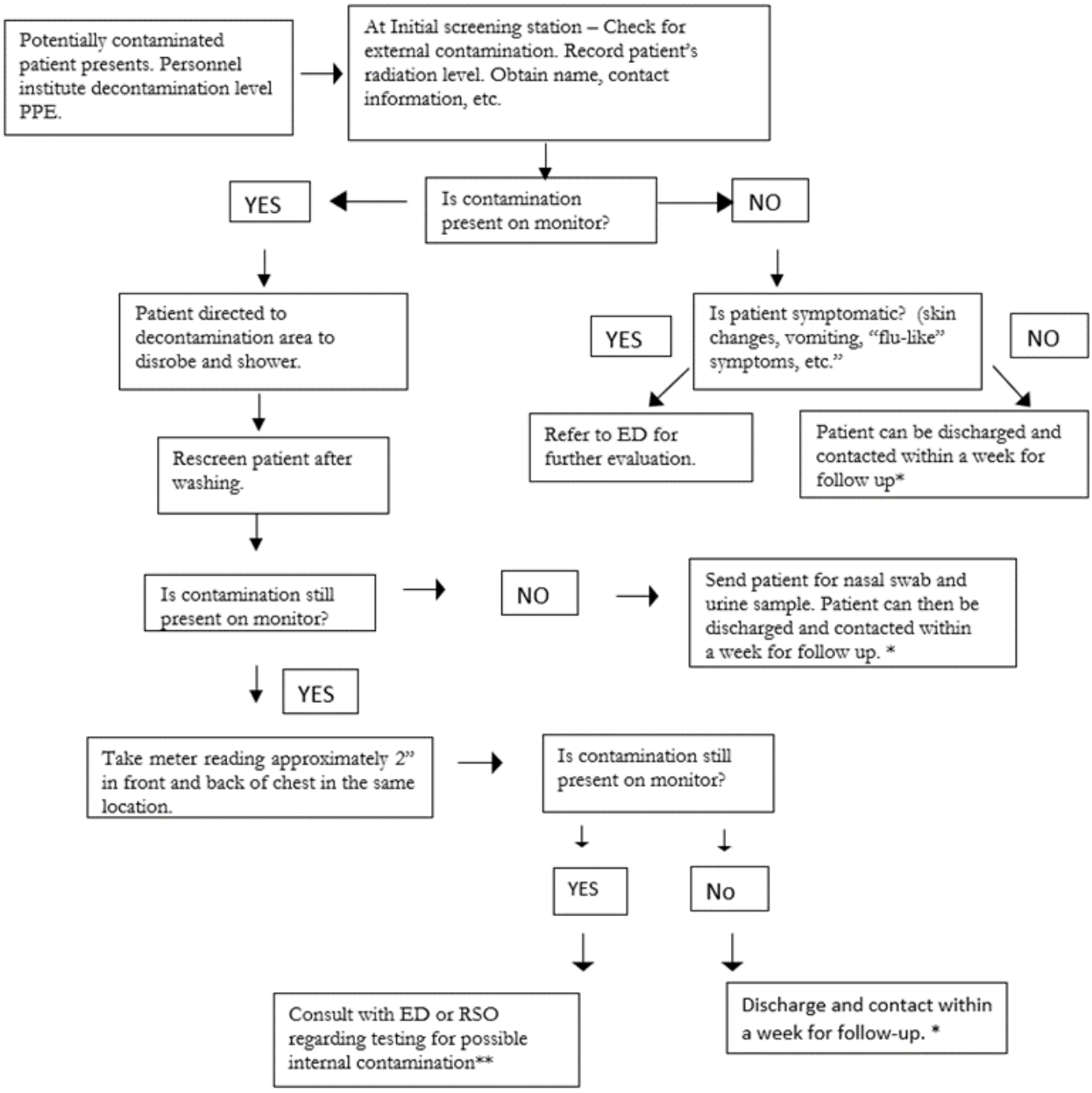
Identification and containment of contaminated areas with drapes and tape should be done to prevent the spread of radioactive nuclides to “clean” areas or areas of lesser contamination. Areas not being immediately decontaminated should be covered and protected.

Reagents and equipment used in decontamination should be monitored closely for radioactive contamination and replaced as needed.

Hand-held radiation detection devices should be covered with a non-sterile glove, which is replaced between each patient reading to avoid misleading readings due to possible accumulation or contamination of the instrument.

Screening and Triage

The following algorithm should be considered at any facility for the purpose of screening and triaging all patients with potential exposure to a radiological/nuclear event.



*Follow up timing and the need for further testing depends on the estimated dose and the dose rate, both of which will be situation dependent. These parameters need to be determined by radiation subject matter experts in collaboration with regional public health and if indicated state DOH coordination.

**ED (Emergency Department) RSO (Radiation Safety Officer)

Contamination Control Measures

The goal of contamination control is to prevent the spread of radioactive materials from the patient, care providers, rescue/EMS crew, and/or equipment used in patient care. Contamination can be transferred to care providers as they touch or move the patient, from contaminated equipment used on the patient to provide care, or from the surrounding area.

- If possible, decontamination and triage areas should be outside the main entrance of the Emergency Department. Clear the area of visitors and patients. Remove or cover any equipment that will not be needed during emergency care of the radiation accident victim.
- Several large plastic-lined waste containers will be needed. The treatment table and stretcher should be covered with several layers of waterproof, disposable sheeting.
- Survey instruments should be checked and ready for use before the patient arrives. Background radiation levels should be documented.
- The Facility Decontamination team and Radiation Safety Officer should be prepared to meet the patient(s) at the ambulance where the patient(s) can be transferred to a facility stretcher.

Defining a Control Line

- A control line should be established at the entrance to the decontamination room. A wide strip of tape on the floor at the entrance to the room should be marked clearly to differentiate the controlled (contaminated) from the non-controlled (uncontaminated) side.
- Rolls of brown wrapping paper or butcher paper three to four feet wide can be unrolled to make a path from the ambulance entrance to the decontamination area. Ordinary cloth sheets or square absorbent pads can be used if paper is unavailable. Whatever the floor covering, it should be taped securely to the floor. This route should then be roped off and marked to prevent unauthorized entry. The floor of the decontamination room or treatment area should be covered in a similar way if time allows. This will make cleanup of the area easier.

Control Ventilation

- While it may be desirable that the room, or rooms, have either a ventilation system that is separate from the rest of the hospital or a means of preventing the unfiltered exhaust air of the radiation emergency area from mixing with the air that is distributed to the rest of the hospital, there is very little likelihood that contaminants will become suspended in air and enter the ventilation system. Hence, no special precautions are advised. (Ref.: AMA. A Guide to the Hospital Management of Injuries Arising from Exposure to or Involving Ionizing Radiation. 1984).

Techniques of Contamination Control

- Set up a controlled area large enough to hold the anticipated number of victims.
- Prevent tracking of contaminants by covering floor areas and monitoring exits of controlled areas.
- Restrict access to the controlled area.
- Monitoring anyone or anything leaving the controlled area.
- Use strict isolation precautions, including protective clothing and double bagging.
- Use a buffer zone or secondary control line for added security.
- Control waste by using large, plastic-lined containers for clothing, linens, dressings, etc.
- Change instruments, outer gloves, drapes, etc., when they become contaminated.

Pediatric Considerations

Decontamination and Special Considerations in the Pediatric Patient exposed to Radiation

The Key Differences between Children and Adults:

- Children are more likely to experience higher external and internal radiation exposure levels than adults due to their smaller physiologic reserves, their immature immune systems, and depending on their age, their inability to understand danger and their tendency to pick up or crawl through contaminated areas without the ability or skills to protect themselves.
- In a dirty bomb scenario, children are at higher risk of traumatic blast and burn injury, that in combination with radiation exposure leads to higher mortality.
- Children have higher baseline heart and respiratory rates quickly exposing them to a greater amount of toxins.
- They have less mature immune systems making them more susceptible to infection from biological agents.
- They have less fluid reserves, which may mean that diarrhea and vomiting are more likely to lead to shock.
- Young children are non-verbal and unable to explain symptoms or history, if they present without an adult care provider accurate history will be unavailable. This includes any significant past medical history and medication allergies.
- Children respond to unknown situations with anxiety, this further clouds the ability to assess them for injury or decontaminate them quickly.
- Small children are more difficult to handle especially when staff are wearing PPE.
- Small children are unable to thermoregulate as well and can become hypothermic more quickly while wet, especially after decontamination.

Special Considerations for Decontamination:

- **Always address life threats before decontamination. Do not delay life saving procedures for decontamination.**
- When possible, staff assigned to pediatric decontamination should be familiar with the vulnerabilities of children and trained in how to address these.
- Caring for children always takes more time and patience.

CHILDREN ARE MORE PRONE TO HYPOTHERMIA DURING DECONTAMINATION WHICH INCREASES RISK OF CLINICAL DETERIORATION.

- Children should only be decontaminated with water and mild soap if necessary. No bleach or alcohol should be used if radiation is the only possible contaminant.
- Assessing children while wearing PPE may be difficult due to the anxiety the PPE may give.
- Clothing should always be labeled and stored in bags for possible evidence.
- Due to the risk of hypothermia, water should be at least 98-100 degrees Fahrenheit at the tap. Wind barriers and heat lamps can assist with preventing hypothermia. Foil/metallic blankets post decontamination can protect against hypothermia.
- Low pressure shower systems should be used to decontaminate children.
- Wet Infants and small children are slippery. Additional systems will increase safety (e.g., hand spraying while on a stretcher, in a bassinet or laundry basket with holes)
- Whenever possible, a parent should accompany any young child needing decontamination. While this may lead to the need to decontaminate the parent, a parent is often the best person to bring the child into the

shower for decontamination to alleviate anxiety and expedite the process and is well worth the additional step. Older pre-teen and adolescent children may be able to decontaminate independently, but never assume. Always explain and ask an older child first before proceeding.

- Tracking may be difficult due to young children being non-verbal. Alternate ways of tracking will need to be considered such as using photos.

WHENEVER POSSIBLE, A PARENT SHOULD ACCOMPANY ANY YOUNG CHILD NEEDING DECONTAMINATION.

Pediatric Treatment and Dosing Considerations:

Pediatric medication dosing is complex and most often weight or surface are based. Resources for specific pediatric dosing for many of the medical countermeasures needed in a radiologic event lack pediatric dosing recommendation and is a continued response gap. However, organizations such as the West Regional Alliance for Pediatric Emergency Management (WRAP-EM) continue to work to close this gap. A recent publication outlines dosing recommendations and next steps.

Emergency Department Response

Anticipate number, acuity, and potential needs of incoming patients (i.e.: decontamination, medications, isolation, etc.).

- Decompress current patient load in Emergency Department.
- Anticipate and plan for personal protective equipment for staff.
- Notify Radiation Safety Officer (RSO) immediately.
- Surgical intervention should not be delayed while awaiting/performing decontamination.
- Based on the type of release, (single spill versus terrorist or explosion) anticipate associated injuries requiring additional care.
- Ensure staff protection and safety first.
- Maintain accurate records of all patient's identity, valuables, care, and disposition.
- Anticipate and cooperate with outside investigating agencies if event is related to an actual or perceived terror attack.

If possible external contamination is involved, save all clothing and bedding from ambulance, blood, urine, stool, vomit, and all metal objects (i.e., jewelry, belt buckle, dental plates, etc.). Label with name, body location, time, and date. Save each in appropriate containers marked clearly "RADIOACTIVE—DO NOT DISCARD."

Preparation For Arrival of Patients

- If adequate time exists as many of the following steps as possible should be in place prior to the arrival of potentially contaminated patients. At minimum RSO should be on the scene. "Dirty" vs "clean" areas should be identified and area monitoring set-up for patient and staff safety. All providers should be in PPE recommended by RSO.
    - Floors of rooms will be prepared by placing tape on the floor at the entrance to the decontamination side from the non-contaminated side.
    - The route from ambulance entrance to decontamination room will be covered with a roll of plastic, paper, or with sheets. Covering can be secured to the floor with tape.
    - The above route will be taped off, if necessary, and marked "Radioactive" until cleared by the RSO.
    - Nonessential equipment will be removed from the room or covered with plastic.
    - If outside, the decontamination corridor from the ambulance drop-off point to the entrance to the decontamination area will be taped off and marked "Radioactive" until cleared by the RSO.
    - Large plastic or metal containers with plastic bags should be provided to receive discarded contaminated clothes, gauze, supplies, etc.
    - The RSO, along with decontamination team members, will begin setting up the decontamination corridor.

Operating Room Safety Guidelines

A victim of a radiation accident who requires either emergency surgery or surgery later who has been exposed only to external radiation, but no contamination, requires no special care in the operating room.

For those victims that require emergency surgery and who might be externally or internally contaminated with radioactive materials, the staff of the operating room should take the following precautions to minimize the spread of contamination:

- A conventional operating room can be used if there is adequate room to accommodate additional personnel along with the standard operating room staff.
- Everything within the operating room (i.e., operating table, back tables, and floor) should be covered with disposable plastic coverings.
- Protective clothing should be instituted to ensure adequate protection of the operating room staff against contamination. The purpose of protective clothing is to keep bare skin and personal clothing free of contaminants. Staff members of the OR team should dress in surgical clothing (scrub suit, gown, mask, cap, eye protection, and gloves). Waterproof shoe covers also should be used. All open seams and cuffs should be taped using masking or adhesive tape. Fold-over tabs at the end of each taped area will aid removal. Two pairs of surgical gloves should be worn. The first pair of gloves should be under the arm cuff and secured by tape. The second pair of gloves should be easily removable and replaced if they become contaminated.
- Unless otherwise instructed by the radiation safety officer (RSO), there is no danger of contamination to the anesthesia and breathing equipment. Other items (i.e., surgical equipment and instruments, and gloves) should be frequently changed to avoid the spread of contamination. An adequate supply of surgical equipment should be present (i.e., triplicate).
- Equipment should be monitored, surveyed, and wipe-tested by the RSO or his/her designee after use. Contaminated items should be placed in a container and stored in the nuclear medicine department. Body areas with gross contamination will be delineated and, if possible, covered with a plastic covering before surgery.
- If an area of bodily contamination is to be surgically incised, it should be washed with normal saline, Betadine, and/or hydrogen peroxide (according to preference of attending surgeon). For persistent contamination, consultation with the RSO might be appropriate regarding the use of diethylenetriaminepentaacetic acid (DTPA) (1 ampule of DTPA per 100 mL of water) or another chelating agent.
- Contaminated tissue and/or debris (i.e., shrapnel) removed from the victim should be placed in an appropriately labeled container and stored in the nuclear medicine department or other area of the hospital designated to be appropriate for storage of radioactive waste. The RSO should be notified of the location and type of stored tissue.
- Upon completion of the surgical procedure, the RSO or his/her designee will survey and wipe-test the remaining surgical equipment, surgical garb, and the plastic coverings of the operating room floor to ascertain contamination. Any items that are found to be contaminated will be placed in a container and transported to the nuclear medicine department for storage until adequately decayed. All personnel should be monitored with a standard Geiger-Mueller meter before exiting the operating room suite.

If Known Radioactive Contaminated Patient Has Been Admitted Prior to Decontamination

- Continue attending to the patient's medical needs.
- Secure the entire area where the patient will be admitted.
- Notify the Radiation Safety Officer to assist in determining transport routes, special considerations.
- Before entry into any potentially contaminated areas, personnel must don the appropriate protective clothing and wear personnel radiation monitoring devices. The purpose of protective clothing is to keep bare skin and personal clothing free of contaminants. Staff members providing direct care to the patient should dress in surgical clothing (scrub suit, gown, mask, cap, eye protection, and gloves). Waterproof shoe covers also should be used. All open seams and cuffs should be taped using masking or adhesive tape. Fold-over tabs at the end of each taped area will aid removal. Two pairs of surgical gloves should be worn. The first pair of gloves should be under the arm cuff and secured by tape. The second pair of gloves should be easily removable and replaced if they become contaminated.
- Upon exit from the decontamination area, the protective clothing must be removed and considered contaminated. It should be placed in a plastic-lined trash container for subsequent disposal or decay. The bag should be clearly marked “Radioactive – Do Not Discard.”
- All personnel must survey their hands, feet, and clothing before leaving the area with a survey meter, ensuring that they are not contaminated.
- Do not allow anyone or anything to leave the area until cleared by the Radiation Safety Officer.
- Hospitalized victims with persistent contamination should be surveyed daily and assessed for potential spread of contamination.
- Bed linen, bedclothes, and supplies will be bagged and surveyed.
- All contaminated items will be bagged, labeled, and stored in the appropriate storage area under the direction of the radiation safety staff.
- **No person or equipment should be allowed to exit from the potentially contaminated area without appropriate monitoring or clearance from the RSO.**

If Radioactive Contamination Is Discovered After Patient Has Been Admitted

- Continue attending to the patient's medical needs.
- Secure entire area where victim and attending staff have been.
- Contact the Radiation Safety Officer.
- Do not allow anyone or anything to leave area until cleared by the radiation safety officer.
- Completely assess patient's radiological status utilizing the screening method in the above “Screening and Triage” algorithm.
- If patient medical status permits, patient decontamination procedures should be instituted under the direction of the RSO.
- Hospital personnel should remove contaminated clothing before exiting area; they should be surveyed, shower, dress in clean clothing, and be resurveyed before leaving area.
- The contamination space and other spaces in contact with the contaminated victim will be surveyed and wipe-tested for contamination and decontaminated as needed.
- Bed linen, bedclothes, and supplies will be bagged and surveyed.
- All contaminated items will be bagged, labeled, and stored in the appropriate storage area under the direction of the radiation safety staff.
- **No person or equipment should be allowed to exit from the potentially contaminated area without appropriate monitoring or clearance from the RSO.**

Dosage and Treatment Considerations

Acute Radiation Syndrome (ARS):

Early Phase (1 hour - 2 days)

- Nausea plus or minus vomiting
- Malaise plus or minus hyper-excitability of reflexes

Asymptomatic Phase (2 hours - 2 days)

- Patient feels well but tissue damage is progressing
- White Blood Count (WBC) drops during first day; first lymphocytes, then granulocytes, to the range of 1000 cells/cc. This is followed by a drop in RBCs and platelets
- Internal bleeding
- Gastrointestinal (GI)
- Skin

Height of disease (2-3 weeks)

- Fever 103 - 104 degrees
- Exhaustion
- Weight loss
- Reddened skin
- Hair loss
- Hemorrhages in skin
- Ulcerated mucous membranes
- GI hemorrhages
- Infection (may be ultimate cause of death)
- Fluid imbalance

Delayed effects in survivors:

- Hair loss
- Cataracts
- Anemia
- Leucopenia may go on to leukemia
- Impaired spermatogenesis
- Premature aging, shortening of life span

Acute Radiation Syndrome Treatment Guidelines

Evaluate as many of the 4 Acute Radiation Syndrome (ARS) sub-syndromes as you have information for by degree of severity. (See Attachment C) and the Radiation Emergency Medical Management website. This link provides an on-line calculator which will help guide management based on the Response Category (RC) score obtained under each sub-syndrome.

Treatment modality (Response Category or RC Grading – see Attachment D) is assigned to the patient based on the highest degree of severity in any sub-syndrome. Please see REMM webpage on Management of ARS for details on how to score and interpret results. Utilizing the charts and graphs attached, patients admitted with suspected ARS will be evaluated upon arrival and daily thereafter as indicated (See attachments D-F for guidance.)

Use of Potassium Iodide:

The Food and Drug Administration has issued guidance on the use of potassium iodide (KI) to reduce the risk of thyroid cancer in children and adults in emergencies involving the release of radioactive iodine into the environment. Data clearly demonstrates the risks associated with thyroid radiation from radioiodine that are inhaled or ingested with contaminated food. When such exposures are likely, KI can be used to block thyroid uptake of radioactive iodine species and thus provide safe and effective protection against thyroid cancer caused by such irradiation when exposure cannot be prevented by other measures.

POTASSIUM IODIDE IS ONLY INDICATED FOR EXPOSURE TO RADIOACTIVE IODINE AND IS MOST PROTECTIVE IF GIVEN BEFORE EXPOSURE.

The FDA recommends a standard daily dose of:

- 16 mg of KI for infants less than one (1) month old.
- 32 mg of KI for children aged one (1) month to three (3) years.
- 65 mg of KI for children and teenagers from three (3) to 18 years old.
- 130 mg of KI for adults, including pregnant, lactating women, and adolescents over 150 lbs.

As a rule, daily dosing should continue until the risk of exposure has passed and/or until other measures (evacuation, sheltering, and control of the food and milk supply) have been successfully implemented. The increased risk of thyroid suppression in the fetus and neonate leads to a specific recommendation that newborns and pregnant women be given priority with regard to these adjunctive measures to obviate, as possible, the need for repeat dosing with KI. The guidance also states that the overall benefits of KI far exceed the risks of overdosing, especially in children, though particular attention should be paid to dose and duration of treatment in infants and in pregnant women.

REMM Scarce Resource Project and Working Group Publications

In a large nuclear detonation with potentially thousands of injured and exposed patients, resources will be scarce. Washington state maintains a Crisis Standards of Care Framework and Guidelines along with a Disaster Medical Advisory Committee to advise state recommendation during times of critical resource shortages. REMM has developed a working group around scarce resources with multiple open publications, as well as videos and an interactive triage tool for myeloid cytokine. These are provided as resources for planning purposes. Specific guidelines for scarce resource management during an event will be determined by the state given the situation at hand.

CHEMICAL EVENT

Chemical response events involve a unique set of challenges. Oftentimes the chemical substance itself is unknown. Many chemical toxins have no visible trace, or are without odor, and thus remain undetected until persons exposed present with clinical symptoms. Clinical symptoms can be vague, such as headache and nausea with a broad differential diagnosis and unless astute clinicians consider possible toxin exposure, misdiagnosis can occur.

Therefore, a high index of suspicion should be maintained especially in situations where numerous patients present with similar symptoms or possible exposure and are tied to a specific event or geographic locations. Clinicians, public health and emergency management should be aware of the potential chemical hazards which exist within their communities such as specific manufacturing, agriculture, laboratories, or industrial complexes which may be a source for possible contamination.

When clinicians are faced with a possible chemical toxic exposure understanding the basic principles and toxidromes will assist in determining if and what type of decontamination is required, the work-up to be considered and the treatment protocols necessary.

IF MULTIPLE PATIENTS ARE PRESENTING WITH A SIMILAR TOXIDROME AND THERE ARE CONCERNS ABOUT WIDESPREAD COMMUNITY EXPOSURE TO A CHEMICAL TOXIN, IT IS ESSENTIAL TO COMMUNICATE THIS TO FACILITY EMERGENCY MANAGEMENT WITH FURTHER NOTIFICATIONS AS OUTLINED IN THE CHEMICAL, RADIATION AND NUCLEAR ANNEXRN SURGE ANNEX.

General Principles and Toxidromes

General Principles: https://www.chemm.hhs.gov/toxprinciples.htm

1. Toxidrome recognition allows for rapid diagnosis and empirical therapy.

Toxic chemicals are grouped together in classes whereby all the chemicals in a certain class cause similar effects on human health. These constellations of symptoms representing a class of compounds are called toxidromes. And the advantage of identifying a toxidrome is that all chemicals which cause a similar toxidrome are treated similarly.

The number and type of toxidromes and their names vary depending on the resource. However, the major toxidromes are noted below with a brief description. The most important physiologic symptoms to play close attention to are the following:

Vital Signs

Mental Status

Pupillary size

Mucous membrane irritation

Pulmonary exam

Skin

2. The route of exposure influences toxicity

A chemical's physical state and the route of exposure influences toxicity. Inhalation exposure affects mucous membranes (eye, nose, respiratory etc). Inhalation also causes rapid entry into systemic circulation so toxic effects can be distant from entry route. For example hydrogen cyanide gas rapidly enters the circulation causing loss of consciousness, seizures, cardiac dysrhythmias and hypotension.

Dermal exposure can cause local effects of burn, skin irritation, blistering. However, many fat-soluble compounds such as organophosphates will penetrate the skin, enter the blood stream and circulate to distant sites. Skin exposure can cause delayed symptoms as opposed to rapid entry via pulmonary physiology.

3. The dose makes the poison

The dose response curve is an important concept in toxicology. The dose depends on the amount of chemical absorbed, the concentration of the chemical and the duration of exposure. High concentrations of a toxin over a long duration are more likely to produce adverse health effects than the same or lower concentrations over a shorter period of exposure.

Major Toxidromes (www.chemm.hhs.gov)

A. **Knockdown Syndrome:**

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 of 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.

B. Cholinergic or Nerve Agent Toxidrome (Pesticide Syndrome)

Over stimulation of cholinergic receptors leading to first activation, and then fatigue of target organs, leading to pinpoint pupils (miosis), wheezing, twitching, seizures and excessive output from all secretory cells/organs including bronchial secretions, sweat, tears, saliva, vomiting, and incontinence.

C. Solvents, Anesthetics or Sedatives

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).

D. Irritant Gas Syndrome

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.

E. Opioid Syndrome

Opioid agonism leads to pinpoint pupils (miosis), and central nervous system and respiratory depression.

F. Anticholinergic Syndrome

Blocking or under-stimulation of cholinergic receptors leads to dilated pupils (mydriasis), decreased sweating, elevated temperature, and mental status changes, including characteristic hallucinations.

G. Convulsant Syndrome

Central nervous system excitation (GABA antagonism and/or glutamate agonism and/or glycine antagonism) leading to generalized convulsions.

A rapid on-line toxidrome identification tool is available at: https://chemm.hhs.gov/chemmist.htm#

THE WASHINGTON POISON CENTER IS AVAILABLE 24/7 TO ASSIST WITH IDENTIFICATION AND TREATMENT OF ANY TOXIN EXPOSURE:

800-222-1222

Patient Decontamination Guidelines

This Toolkit is not intended to provide in-depth discussion on patient decontamination. Every facility should maintain specific decontamination plans which should include consistent education and training. Below are high level Guidance Statements taken from the US Department of Homeland Security and Health and Human Services Patient Decontamination in a Mass Chemical Exposure Incident National Planning Guidance

Guidance Statement 1.1

The decision to decontaminate should take into account a combination of key indicators, including (but not limited to):

- Signs and symptoms of exposure displayed by the patient;

- Visible evidence of contamination on the patient's skin or clothing;
- Proximity of the patient to the location of the release;
- Contamination detected on the patient using appropriate detection technology;
- The chemical identity (if known), physical state, characteristics, and behavior; and
- Request by the patient for decontamination, even if contamination is unlikely

However, in general lifesaving measures (ACLS, ATLS, antidote therapy, etc) should take priority over decontamination.

IMMEDIATE, LIFESAVING MEDICAL CARE AND/OR ANTIDOTE THERAPY SHOULD IDEALLY BE A PRIORITY, OVER PATIENT DECONTAMINATION.

Guidance Statement 1.2:

Decontamination should be performed if the potential contamination on a patient requiring transport to, or care in, a health care facility poses a reasonable risk of exposure to first responders, first receivers, other patients, or contamination of critical infrastructure.

Guidance Statement 1.3:

If the likelihood of adverse consequences from water-based decontamination methods outweighs the likely health outcome gains, then patient decontamination should be performed using alternative practices. Patient decontamination is not without risk to the patient, steps should be taken to mitigate these risks and reduce the negative impact on patients.

Exposure vs. Contamination
A key determinant for estimating risk is distinguishing chemical exposure alone from chemical exposure with contamination. A chemical exposure may occur without deposition on clothing or body surfaces. For example, a person engulfed in a cloud of gas (e.g., carbon monoxide) will not become contaminated with carbon monoxide depositing on the clothing or body surfaces. On the other hand, an aerosol cloud of a toxic chemical (e.g., hydrofluoric acid) can condense on clothing and skin, contaminating the person. Therefore, a patient can be exposed to a chemical without contamination or be exposed as well as contaminated. Through risk-based assessment, responders and receivers can identify people who were near the release and potentially exposed, but not likely to be contaminated.

Guidance Statement 2.1

A risk-based approach should be employed by a responding or receiving organization to determine the appropriate response level and associated strategies and tactics, including PPE, medical interventions, and patient decontamination.

Guidance Statement 2.2

A tiered approach to patient decontamination allows responders and receivers to base the nature and level of decontamination on the type and extent of contamination, as estimated through a risk-based assessment of the incident, as well as available resources. The tiered decontamination response is flexible and adaptable to various types of incidents; each tier can be executed either at the scene or at a health care facility.

Decontamination activities conducted for a large number of potentially contaminated patients, which may exceed the typical response capacity of an organization, may require additional resources or personnel, and require that patients be prioritized for the decontamination process.

Guidance Statement 2.3

Self-care and/or gross patient decontamination actions should occur as quickly as possible, while decisions on the need and process for technical patient decontamination are made and equipment is set up, if warranted.

Guidance Statement 2.4

Attempt to immediately decrease ongoing exposure by removing all patients out of the area of chemical release to a designated safe area.

Guidance Statement 2.5

Clothing removal for patients who have been visibly contaminated or who are suspected of having been contaminated is an essential aspect of decontamination. For patients who can remove their own clothing, it can be a part of self-care. Efforts should be made to collect and account for clothing and personal items removed during patient decontamination

Guidance Statement 2.6

Privacy for patients should be incorporated throughout the decontamination process, within the resource limitations of the responding or receiving organization, to include:

- Privacy during clothing removal
- Segregation of males and females during decontamination and
- Materials for redressing following decontamination

Guidance Statement 2.7

Water is the preferred decontaminant in the case where gross patient and/or technical patient decontamination is deemed appropriate, unless specific information about the contaminant indicates otherwise.

Guidance Statement 2.8

The following parameters are recommended for water-based decontamination, unless specific information about the contaminant indicates otherwise:

- Low pressure (~50 – 60 psi), although should be adjusted down for pediatric patients
- High volume
- Tepid (i.e., slightly warm, not hot) temperature; and
- Duration no longer than three minutes; ensure thorough soaking

Guidance Statement 2.9

When water-based decontamination is indicated, mild soap, if available, should be added to water for gross patient and technical patient decontamination, especially if the contaminant is thick, oily, or otherwise difficult to remove by water alone. Although water alone decontamination should not be delayed if soap is not readily available.

Guidance Statement 2.10

The use of a non-abrasive sponge, washcloth, or similar wash item may enhance water-based decontamination by increasing the physical removal of a contaminant through lightly rubbing contaminated areas.

Guidance Statement 2.11

Alternative practices or decontaminants should be incorporated into the decontamination process when water-based decontamination is contraindicated (e.g., due to weather/environmental concerns, chemical reactivity) or delayed (e.g., resource or capability limitations or logistics). Planning should include identifying possible alternative locations (e.g., showers at a gym or swimming pool) for water-based decontamination when necessary.

- Alternative decontamination practices in lieu of water-based decontamination include:
  - o Delaying water-based decontamination; and
  - o Non-water-based decontamination techniques
- Alternative decontaminants include:
  - o Approved neutralizing agents (e.g., partitioning and chelating agents);
  - o Chemical specific decontaminants (e.g., polyethylene glycol (PEG) for phenolic compounds);
  - o Absorbent materials (e.g., spill pads, oil-dry, kitty litter, Fuller's Earth); and
  - o Adsorbent materials (e.g., activated carbon)

Guidance Statement 3.1

Decisions on whether contamination has been reduced to a level that is safe or additional decontamination is necessary can be guided by the following indicators (and others as appropriate):

- Elimination of visible contamination from the skin and/or clothing;
- Observable improvement in signs and symptoms which prompted the decision to perform decontamination;

•Patient perceptions of the effectiveness of decontamination;

•Results from appropriate detection technologies;

•If an effective decontamination method, which is known to be appropriate given the nature of the incident and chemical involved, is properly executed, then a sufficient reduction in contamination can be implied.

Guidance Statement 3.2

Timeliness and efficiency are critical elements of effective patient decontamination: an individual patient needs to be decontaminated with minimal delay and patients in a mass exposure incident need to be decontaminated expeditiously in order to do the greatest good for the greatest number. However, a rapid pace must be balanced with quality and consistency of patient care to achieve the goals of providing first aid to patients and protecting responders, receivers, and health care infrastructure from secondary contamination.

Guidance Statement 4.1

Prioritize patients for decontamination by estimating relative risk and grouping patients into urgent and non-urgent decontamination groups. Risk assessment should take into consideration the following criteria (and others as appropriate) in preferential order:

- Need for immediate lifesaving care or antidotal therapy (see statement 1.1 above)
- Visible evidence of contamination on patient's skin or clothing;
- Patients displaying signs and symptoms of exposure;
- Proximity of patient to the location of release; and
- Contamination detected on patient using appropriate detection technology

Guidance Statement 5.1

If decontamination is indicated, it should be performed as soon as possible, preferably at the scene if not contraindicated by safety considerations.

Guidance Statement 5.2

Anticipate self-evacuation from the scene prior to decontamination and develop a coordinated whole community response plan to manage the entire spectrum of patients, which include:

- At scene: ambulatory and non-ambulatory patients who remain at the scene; individuals other than responders who arrive at the scene after the release and become exposed (e.g., news reporters, bystanders);
- Self-evacuated: patients who travel without the assistance of responders to a health care facility (e.g., hospital, physician's office, or urgent care center); and
- Left scene: patients who leave the scene and do not seek care (e.g., return home or travel elsewhere), or seek care later due to delayed onset of signs and symptoms

Guidance Statement 5.3

Responding and receiving organizations should plan for both ambulatory and non-ambulatory patients simultaneously.

- Ambulatory patients should be able to follow verbal, written, or posted directions with no physical assistance from first responders or first receivers.
    - o May be helped by “buddy” or family member
- Non-ambulatory patients will need personnel to assist them through the process.
    - o Specialized equipment will be needed (e.g., backboards, raised working surface/roller tables).

Guidance Statement 5.4

Responding and receiving organizations should implement planning and training to assist at-risk populations through the decontamination process.

- At-risk individuals have needs in one or more of the following functional areas: communication, medical care, maintaining independence, supervision, and transportation.
- At-risk populations may include infants, children, the elderly, and pregnant women, as well as people who have functional or mobility impairments, live in institutionalized or congregate settings, have limited English proficiency or are non-English speaking, or have cognitive impairments.

Guidance Statement 5.5

A formal rapid communication procedure should be utilized to provide advance notice to area health care facilities of a hazardous chemical incident and to specifically alert facilities to the possibility of self-evacuated patients needing assessment of contamination and arriving unannounced to health care facilities.

Guidance Statement 5.6

Notification, by graphic, written, or verbal means, and ideally a combination of all three, should be used to record scene decontamination practices for clear communication and coordination with health care facilities.

Guidance Statement 5.7

PPE selection, training, and use should be based on applicable, SME recommendation, and manufacturers’ specifications, in conjunction with scene evaluation and risk assessment.

Guidance Statement 5.8

Scene response and health care facility emergency planners should work with federal, state, and local government officials to ensure any guidance, practices, and plans properly address applicable laws, regulations, and guidance concerning environmental issues, such as the management of liquid and solid wastes, environmental monitoring of decontamination area(s), and other environmental impact issues.

Guidance Statement 6.1

Communication is an essential component of effective disaster management. Crisis and emergency risk communication should be incorporated into all stages of disaster management, so that planning addresses

communication before, during, and after an incident. All personnel expected to respond to a mass casualty chemical incident should receive job-appropriate training in crisis and emergency risk communication. Use these best practices for effective communication with the public:

- Build trust;
- Announce early;
- Be transparent;
- Respect public concerns; and
- Plan in advance

Guidance Statement 6.2

Develop a strategic communications plan for delivering various types of messages during an incident. Prepare as much material in advance as possible: identify message topics and their audiences; write pre-scripted messages; and identify appropriate spokespeople or messengers for each type of message. Communication needs to be coordinated across all organizations so that a single message is spoken with many voices throughout the community.

Guidance Statement 6.3

Public education can be achieved by using naturally occurring opportunities to communicate patient decontamination goals; potential practices; responsibilities of responders, receivers, and patients; and expected outcomes. A strategic plan for pre-incident communication to enhance community preparedness should be developed to include information about patient decontamination in community outreach by fire service and EMS organizations, public service announcements, and other planned events.

Guidance Statement 6.4

To facilitate effective two-way communication during and after an incident:

• Provide patients with pre-scripted and printed follow-up information before they leave the scene or prior to discharge from the health care facility.

• Obtain patient contact information prior to release from the health care facility to allow for follow-up by public health officials.

• Establish an easily accessible mechanism for patients to obtain additional information or advice and for authorities to respond directly to patients' questions or comments.

• Provide follow-up information for other community members who were either at the scene and not decontaminated or not at the scene.

Response Tools

Below are useful materials to use during a chemical event. Forms can be modified to work for your facility or region.

- HHS CHEMM Triage Guidelines
  Includes resources for triaging during a chemical incident.
- HHS CHEMM Information for First Responders
  Includes resources for first responders responding to chemical emergencies.
- HHS CHEMM Information for the Hospital Providers
  Resources for hospital providers while responding to a chemical emergency.
    - Specifically treatment and dosing for nerve agent management can be found here.
- CDC: Chemical Emergency Information for First Responders
  Information, education, and resources for first responders during a chemical incident.

Education and Training Resources

- FEMA Emergency Management Institute Courses
  The following courses have a Chemical Emergency focus: IS-5.A and IS-346.
- University of Nebraska Medical Center: HEROES - Chemical Preparedness and Response
- HHS: PRISM Primary Response Incident Scene Management
  Decontamination guidance for chemical incidents

CRN Contact Information

Name of Institution	**Phone number (24/7)**
NWHRN Duty Officer	425-988-2897
Seattle Cancer Care Alliance	206-982-3773
DOH Duty Officer	360-888-0838
WA Office of Radiation Protection	206-682-5327
WA Emergency Management Division Operations Officer	800-258-5990
WA Poison Center	800-222-1222
REAC/TS, Oakridge TN	865-576-3131 After hours: 865-576-1005

Resources

Attachment A: Types of Radiation, Sources and Decontamination Recommendations

Attachment B: Radiologic Subsyndromes

Attachment C: Response Category Grading

Attachment D: Acute Radiation Syndrome (ARS) – Sample Treatment Checklist

Attachment E: Acute Radiation Syndrome (ARS) with Neutropenia Treatment Recommendations

Attachment F: Web-based Resources

Radiation

Attachment A: Types of Radiation, Sources and Decontamination Recommendations

Type	Characteristics	Usual Sources	Decontamination Requirements
Alpha	• Alpha radiation is a heavy, very short-range particle. • Alpha radiation is not able to penetrate human skin or clothing. • Alpha emitting materials can be harmful to humans if the materials are inhaled, swallowed, or absorbed through open wounds. • Alpha radiation travels only a short distance (a few inches) in air but is not an external hazard.	• Radium • Radon • Uranium • Thorium	• Removal of all clothing, jewelry, etc.
Beta	• Beta radiation is a light, short range particle. • Beta radiation may travel several feet in air and is moderately penetrating. • Beta radiation can penetrate human skin to the "germinal layer," where new skin cells are produced. If high levels of beta emitting contaminants are allowed to remain on the skin for a prolonged period of time, they may cause skin injury. • Beta emitting contaminants may be harmful if deposited internally. • Clothing provides some protection against beta radiation.	• Strontium-90 • Carbon-14 • Titritium • Sulfur-35	• Removal of all clothing, jewelry, etc • Soap and water decontamination • Re-evaluate for continued contamination after initial decon. and perform secondary soap and water decontamination as needed. • Decontaminate open wounds first, then cover with clean gauze.

Gamma	• Gamma radiation or x rays are very long range, penetrating electromagnetic radiation. • Gamma radiation or x rays are able to travel many feet in air, and many inches in human tissue. It readily penetrates most materials. • Dense materials are needed for shielding from gamma radiation. • Clothing provides little shielding from penetrating radiation. • Gamma radiation and/or characteristic x rays frequently accompany the emission of alpha and beta radiation during radioactive decay.	• Iodine-131 • Cesium-137 • Cobalt-60 • Radium-226 • Technicium-99m	• Removal of all clothing, jewelry, etc. • Soap and water decontamination. • Re-evaluate for continued contamination after initial decon and perform secondary soap and water decontamination as needed. • Decontaminate open wounds first, then cover with clean gauze.

Attachment B: Radiologic Subsyndromes

NEUROVASCULAR SUBSYNDROME				
Sign/Symptom/Test	**Degree 1**	**Degree 2**	**Degree 3**	**Degree 4**
Nausea	Mild	Tolerable	Intense	Excruciating
Vomiting	Occasional:1/day Intermittent	2-5/day Persistent	6-10/day Refractory	>10/day or parenteral nutrition
Anorexia	Able to eat and drink. Reasonable intake	Significantly decreased intake but able to eat	No significant intake	Parenteral nutrition
Fatigue	Able to work or perform normal activity	Able to work or perform normal Activity	Needs assistance for self-care	Prevents daily activity
Headache	Minimal	Minimal	Intense	Intense
Vital signs	Temp < 38 degree C HR > 100 BP > 100/70	Temp 38-40 degree C BP < 100/70 unstable vital signs	Temp > 40 degree C for less than 24 hours; BP < 90/60; transient or intermittent drop or unstable	Temp > 40 degree C for more than 24 hours; hypotension: BP < 80/?
Neurological deficits	No major neurological deficit. Able to perform normal activities	Easily detectable mild neurological deficit; No significant interference with normal activity	Prominent neurological deficit. Significant interference with normal Activity	Life threatening neurological signs. Possible loss of consciousness
HEMATOPOIETIC SUBSYNDROME				
Sign/Symptom/Test	**Degree 1**	**Degree 2**	**Degree 3**	**Degree 4**
24 - 48 HOURS Serial CBCs recommended to improve estimation of severity.				
Lymphocyte count (109 cells/L)	≥ 1.5	1.5 - 1	1 - 0.5	< 0.5
Granulocyte count (109 cells/L)	> 2	4 - 6, mild granulocytosis	6 - 10, moderate granulocytosis	> 10, marked granulocytosis
Platelet count (109 cells/L)	≥ 100	100 - 50	100 - 50	100 - 50
3 - 7 DAYS Serial CBCs recommended to improve estimation of severity.				
Lymphocyte count (109 cells/L)	≥ 1	1 - 0.5	0.5 - 0.1	< 0.1
Granulocyte count (109 cells/L	> 2	> 2	> 5 *	> 5 *

Platelet count (109 cells/L)	≥ 100	100 - 50	50 – 20 *	< 20 *
CUTANEOUS SUBSYNDROME				
Sign/Symptom/Test	**Degree 1**	**Degree 2**	**Degree 3**	**Degree 4**
Erythema (Hours - 30 days)	Minimal and transient.	Moderate. isolated patches <10 cm2; not more than 10% of body surface area (BSA)	Marked. isolated patches or confluent; 10-40% of BSA	Severe. isolated patches or confluent; >40% of BSA;
Altered sensation/ Itching (Hours - 30 days)	Pruritus	Slight and intermittent pain	Moderate and persistent pain	Severe and persistent pain
Edema (5 days - 8 weeks)	Present; asymptomatic;	Symptomatic; tension	Secondary dysfunction	Total dysfunction
Blistering (5 days - 8 weeks)	Rare, with sterile fluid	Rare with hemorrhage	Bullae with sterile fluid	Bullae with hemorrhage
Desquamation (5 days - 8 weeks)	Absent	Patchy dry	Patchy moist	Confluent moist
Ulcer/necrosis (5 days - 8 weeks)	Epidermal only	Dermal	Subcutaneous	Muscle/bone involvement
Hair loss (2 - 8 weeks)	Thinning, not striking	Patchy, visible	Complete and most likely reversible	Complete and most likely irreversible
Onycholysis (2 - 8 weeks)	Absent	Partial	Partial	Complete
GASTROINTESTINAL SUBSYNDROME				
Sign/Symptom/Test	**Degree 1**	**Degree 2**	**Degree 3**	**Degree 4**
Diarrhea - frequency	2-3 stools/d	4-6 stools/d	7-9 stools/d	>= 10 stools/d Refractory diarrhea
Stool - consistency	Bulky or normal	Loose	Very lose	Watery
Blood in stool	Occult	Intermittent	Persistent	Gross hemorrhage
Abdominal cramps / pain	Minimal	Tolerable	Intense	Excruciating
Vomit	See Neurovascular System			
Nausea	See Neurovascular System			

* Note a high granulocyte with low platelets is a poor prognostic sign

Modified from the NIH REMM draft ARS treatment website, which created the original by modifying from Fliedner, TM, Friesecke, I, Beyrer K. Medical

Management of Radiation Accidents: Manual on the Acute Radiation Syndrome. Oxford: British Institute of Radiology; 2001

Attachment C: Response Category (RC) Grading

Please see REMM webpage on Management of ARS for details on how to score and interpret results.

RC GRADING

Organ Specific Assessment	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Neurological Assessment										
Nausea										
Vomiting										
Anorexia										
Fatigue										
Fever										
Headache										
Hypotension										
Neurological Assessment										
Neuro Grade										
Hematopoietic Assessment										
Absolute Lymphocyte Count										
Absolute Granulocyte Count										
Platelet Count (un-transfused)										
Blood Loss										
Infection										
Heme Grade										
Cutaneous Assessment										
Erythema										
Sensation										
Edema										
Blisters										
Desquamation										
Ulcer/Necrosis										
Hair Loss										
Onycholysis										
Skin Grade										
Gastrointestinal Assessment										
Diarrhea										
Abdominal Pain										
GI Grade										
Overall RC Grade										

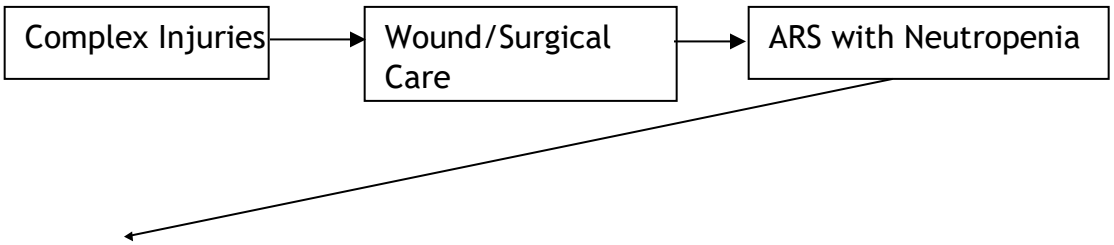
Place patient sticker here

Attachment D: Acute Radiation Syndrome (ARS): Sample Checklist

Triaged to hospital with diagnosis of ARS	**Day 1**	**Day 2**	**Day 3**	**Day 4**	**Day 5**	**Day 6**	**Day 7**	**Day 8**	**Day 9**	**Day 10**
Case History	**X**									
Physical Examination	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Eval by Surgery, if applicable	**X**									
Eval by Burn, if applicable	**X**									
Appropriate Decontamination	**X**									
Diagnostics										
CBC w/diff	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Reticulocyte Count	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
PT/PTT/INR	**X**		**X**			**X**			**X**	
Type and Screen	**X**		**X**			**X**			**X**	
Chem 20	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
HLA Typing of Patient	**X**									
HLA Typing of Siblings										
Urinalysis	**X**									
Bone Marrow Aspirate and Biopsy	**??**					**??**				
Interventions										
Place Central Triple Lumen Line	**X**									
Chest X-ray	**X**									
EKG	**X**									
Echocardiogram						**X**				
Wound/Surgical care	**X**									
Reverse Isolation	**X**									
NPO	**X**									
Start Fungal Coverage	**X**									
Start Quinolone	**X**									
Start Acyclovir, for all	**X**									
Start 5Ht3 Inhibitor	**X**									
Start Proton Pump Inhibitor	**X**									
Start Imodium, if indicated	**X**									
Skin Care	**X**									
Consider KI Therapy, if indicated	**X**									
Advanced Therapeutics										
Consider Stem Cell Support						**X**				
Start Donor Search, if indicated						**X**				

Attachment E: ARS with Neutropenia Treatment Recommendations

Decisions are to be based on clinical parameters and estimated biological effects. As always, treat complex injuries requiring surgical or wound care first.



Hematopoietic Support	**Antimicrobial Support**	**GI Support**
1. Start G-CSF (300 mcg/m2/d)	1. Reverse Isolation	1. 5HT3 inhibitor, lorazepam for nausea/vomiting
2. Consider PICC line	2. When neutropenic, start fluconazole	2. Proton pump inhibitor
3. Blood product support: irradiated and leukoreduced (keep Hgb > 7 g/dl, platelets >10,000μL).	3. If HSV+ start Acyclovir	3. Imodium for diarrhea
4. HLA type victim[1]	4. PCP prophylaxis (pentamidine)	
5. Search for donors[2]	5. Start fluoroquinolone[3]	
	6. Consider coverage for skin flora if burns are present	

[1] If estimated whole body radiation dose 3-10 Gy

[2] If neutrophils <100/ul by Day 6

[3] Agents may vary by center depending on availability and at physician's discretion

Attachment F: Web-Based Resources

HHS Radiation Emergency Medical Management (REMM)

Radiation Injury Treatment Network

Radiation Emergency Assistance Center/Training Site (REACT/S)
Oak Ridge institute for Science and Education

REMM Radiological Dispersal Device Information

Medical Response to a Nuclear Detonation: Creating a Playbook for State and Local Planners and Responders

SRDRS Webinars: Southern Regional Disaster Response System (Radiation/Nuclear)

DOH – Radiation Emergencies

National Radiological Emergency Preparedness Conference, Inc

National Council on Radiation Protection and Measurements:

CDC: Radiation Emergencies

National Alliance for Radiation Readiness

Federal Radiologic Monitoring and Assessment Center (FRMAC)

Army Medical Consequences of Radiological and Nuclear Warfare

Radiation Dispersal Device (RDD) Resources:

Video (First 100 minutes)

DHS/FEMA: RDD Planning Guide first 100 minutes

EMS Handbook – First 12 hours

RAD Responder: collaborative between FEMA, DOE/NNSA and EPA, developed as a solution to lessons learned about data management and data sharing following Fukushima disaster 2011

Radiation Triage Treat and Transport System (RTR)

National Council on Radiation Protection and Measurements

Chemical

Additional Resources

- ATSDR: Managing Hazardous Materials Incidents (MHMIs)
  Resources for EMS, Hospital Emergency Departments and Medical Management Guidelines in relation to hazardous materials.
- ASPR TRACIE: Chemical Hazards
  Healthcare emergency preparedness information on chemical hazards and emergencies.
- CDC: Chemical Emergencies (English/Spanish)
  Information, resources and education for professionals and individuals.
- FEMA: Hazardous Response Capabilities
  Materials focused on Hazardous Response Capabilities
- HHS: Chemical Hazards Emergency Medical Management (CHEMM)
  Guidance on diagnosis and treatment for health care providers.
- Harvard School of Public Health: Hospital Based Decontamination Preparedness Resources (PDF)
  Material focused on hospital-based decontamination and how to prepare for it.