# ASPR TRACIE Technical Assistance

**Requestor:** ASPR
**Response Date:** 4/19/17
**Type of TA Request:** Complex

## Request:

HHS ASPR is participating in the national level exercise "Gotham Shield." Based on the exercise scenario, and in anticipation of potential information and technical assistance needs, ASPR TRACIE developed this list of resources.

## Response:

The ASPR TRACIE Team gathered resources on a variety of topics that may be addressed during exercise play based on the notional detonation of an improvised nuclear device.

In addition to the resources outlined in this document, ASPR TRACIE has subject matter experts available for consultation in each of these subject areas:



## I. Community Reception Centers

Community Reception Centers (CRC) are locations that would be established by federal, state, or local authorities to handle the initial influx of victims and evacuees from a radiological event. The purpose of these facilities is to provide triage, decontamination, and population monitoring until all potentially affected people have been evaluated for the following:

- Necessary medical treatment
- The presence of radioactive contamination on the body or clothing (external contamination)
- The intake of radioactive materials into the body (internal contamination)
- The removal of external or internal contamination (decontamination)
- The radiation dose received and the resulting health risk from the exposure
- Long-term health effects (usually determined through a population registry that can span decades)

According to the Centers for Disease Control and Prevention (CDC) document Population Monitoring in Radiation Emergencies, the primary health objectives for the initial and secondary response are:

- Identify individuals whose health is in immediate danger and who need immediate care, medical attention (whether radiation-related or not), or decontamination.
- Identify people who may need medical treatment for contamination or exposure, further evaluation, or short-term health monitoring.
- Recommend (and, to the extent possible, facilitate) practical steps to minimize the risk of future health consequences (e.g., cancer).
- Register potentially affected populations for long-term health monitoring.

Additional resources follow. A resource preceded by an asterisk indicates that the resource was classified under more than one category.

## Federal Resources

Centers for Disease Control and Prevention (2015). Community Reception Center (CRC) Drill Toolkit.

The CRC Drill toolkit provides guidance and templates that any jurisdiction can adapt to exercise the full range of CRC operations. The drill was developed to be compatible with the U.S. Department of Homeland Security's Homeland Security Exercise and Evaluation Program (HSEEP). It also incorporates insights, issues, and lessons learned from real-world events.

Centers for Disease Control and Prevention. (2014). Population Monitoring in Radiation Emergencies: A Guide for State and Local Public Health Planners. Second Edition.

This guide provides information for state and local planners to develop post radiological emergency response plans. This guide describes processes for managing the radiation monitoring required to evaluate exposure in the affected population, including the use of community reception centers.

Centers for Disease Control and Prevention (2011). Virtual Community Reception Center.

This interactive webpage is designed as a planning/training experience where users learn how to describe the process flow, identify key stations, and recognize essential services for each station in a community reception center.

## State Resources

Florida Department of Health. (2011). After-Action Report and Improvement Plan Matrix.

This report covers the July 12, 2011, Community Reception Center (CRC) Drill conducted at Cypress Creek High School in Orlando, Florida. The Improvement Plan highlights recommendations and adjudications to the state CRC plan. Appendices are included.

Florida Department of Health. (n.d.). Community Reception Center (CRC) Form. (Accessed 4/25/2017.)

First responders can use this intake form as a model when creating their own CRC forms. It includes incident-specific questions and two pages of instructions.

*Radiation Response Volunteer Corps and Population Monitoring. (n.d.). Radiation Response Volunteer Corps and Population Monitoring. (Accessed 4/25/2017.)

This website includes a "Templates and Forms" tab that takes the user to a Dropbox page. Select templates include:

Kansas Community Center Flow Diagram
Kansas Radiation Incident Community Reception Center Standard Operating Guidelines
Kansas Department of Health and Environment CRC Template
Union County (OH) Example CRC Supply and Equipment List

## Local Resources

Chatham County (GA) Health Department. (2013). EOP/ Incident Annex G / Appendix 1: CRC Specifications.

Appendix 1 includes Community Reception Center (CRS) features and requirements, and includes an equipment list, a staffing matrix, and a list of potential CRC sites.

Federal Emergency Management Agency. (2010). Millstone Power Station. After-Action Report/Improvement Plan.

This report covers the June 30, 2010 Host Community Reception Center (CRC) Drill conducted in Windham, CT. The Improvement Plan highlights recommendations and adjudications to the state CRC plan specific to the performance of offsite response organizations. Appendices are included; Appendix C specifically covers the CRC.

Los Angeles County. (2009). Playbook 9: Monitoring People for Contamination at Public Reception Centers. Los Angeles County Multi-Agency Radiological Response Plan.

This document provides steps for responders to take upon receipt of residents at Community Reception Centers. It includes forms for responders and handouts for visitors.

Los Angeles County (2009). Community Reception Center Flow Diagram.

This is a set of floorplans for various stages of CRCs, including intake, emergency medical care or transfer, and discharge.

*Radiation Response Volunteer Corps and Population Monitoring. (n.d.). Radiation Response Volunteer Corps and Population Monitoring. (Accessed 4/25/2017.)

This website includes a "Templates and Forms" tab that takes the user to a Dropbox page. Select templates include:

## Other Resources

Matariyeh, A. (2013). Reception Centers in Response to Radiological Hazards: Correctly Triaging Survivors.

This master's thesis publication includes a detailed literature review of published and gray literature on the effectiveness of community reception centers for managing population evaluation.

# II. Crisis Standards of Care

## What is Crisis Standards of Care/ Allocation of Scarce Resources?

Crisis Standards of Care can be defined as a substantial change in usual healthcare operations and the level of care it is possible to deliver, which is made necessary by a pervasive (e.g., pandemic influenza) or catastrophic (e.g., earthquake, hurricane) disaster. This change in the level of care delivered is justified by specific circumstances and is formally declared by a state government, in recognition that crisis operations will be in effect for a sustained period. (IOM, 2012).

## What Do I Need to Know About Crisis Standards of Care?

Medical care that is rendered during a mass casualty event occurs across three phases on a continuum (conventional care, contingency care, crisis care) as illustrated below (Hick, 2012):[1]

Incident demand / resource imbalance increases →
Risk of morbidity / mortality to patient increases →
← Recovery

| | Conventional | Contingency | Crisis |
|---|---|---|---|
| Space | Usual patient care space fully utilized | Patient care areas re-purposed (PACU, monitored units for ICU - level care) | Facility damaged / unsafe or non-patient care areas (classrooms, etc) used for patient care |
| Staff | Usual staff called in and utilized | Staff extension (brief deferrals of non-emergent service, supervision of broader group of patients, change in responsibilities, documentation, etc) | Trained staff unavailable or unable to adequately care for volume of patients even with extension techniques |
| Supplies | Cached and usual supplies used | Conservation, adaptation, and substitution of supplies with occasional re-use of select supplies | Critical supplies lacking, possible re-allocation of life-sustaining resources |
| Standard of care | Usual care | Functionally equivalent care | Crisis standards of care |

Normal operating conditions — Extreme operating conditions

[1] The source for all tables in this TA response is: Hick, J.L., Hanfling, D., and Cantrill, S.V. (2012). Allocating Scarce Resources in Disasters: Emergency Department Principles. Annals of Emergency Medicine. 59(3): 177-187.

The objective of mass casualty response is for healthcare systems to remain in the conventional and contingency phases of response or to return to them as quickly as possible by effective management of resources.

Four resource categories are the key to successful hospital surge capacity implementation. Emergency medical providers should understand the resources available to them in these areas and how additional resources or assistance may be obtained:

1. **Space**: adequate physical space to care for patients. This may include subcategories such as critical care, medical/surgical, and pediatrics but also includes availability of adequate outpatient space. Emergency providers should understand the expansion/surge plans for their department and region, including those related to the triaging of patients to other locations or the opening of other clinical areas for emergency care.
2. **Staff**: sufficient, appropriately trained staff, including subspecialty staff. This includes the ability to call in qualified staff and extend the capacity of current staff (e.g., by changing expectations during the event for charting and other more administrative duties).
3. **Supplies**: sufficient pharmaceutical and medical supplies and equipment to provide care for the arriving patients. Availability of supplies varies greatly, depending on the size of the facility, its level of preparedness planning, and its role in the community (e.g., children's hospital, trauma center, or Veterans Administration facility).
4. **Special**: considerations for specific events or populations outside of the usual clinical resources (e.g., availability of airborne infection isolation rooms or decontamination, burn, or pediatric services).

## Supplies

Supplies for contingencies should be cached according to the hospital's hazard analysis (including the potential for catastrophic incidents and the risk of its isolation from usual supply chains, etc.) and its agreements with other hospitals in the area. This graphic illustrates a sample listing of contingency supplies maintained at a burn center as part of a metropolitan area burn plan (Hick, Hanfling, and Cantrill 2012):

**Table 1**

Contingency supplies for 50 burn casualties—first 24 hours (50% body surface area burn).

| Supply | Amount per Patient | ×50 Patients |
|---|---|---|
| Bacitracin | 8 oz/day | 25 lb |
| Petrolatum-impregnated dressing 8×18 | 15 sheets/day | 750 sheets |
| Kerlix 4.5-in | 10 rolls | 500 rolls |
| Morphine | 10 mg/h=240 mg/day | 12 g |
| Lorazepam | 5 mg/h=120 mg/day | 6 g |
| Tetanus booster | 0.5/patient (assume 50% need) | 25 |
| Lactated Ringer's | 4 mL/kg×70 kg×50%=14 L | 700 L |
| Central line kit | 1 | 50 |

In general, clinical resource shortages can be anticipated to occur in the following areas:

- Oxygen
- Medications
- Hemodynamic support (including intravenous fluids)
- Ventilators and other life-sustaining technologies such as extracorporeal membrane oxygenation
- Staff (medical and nursing in particular)
- Blood products (unlikely to be in national shortage, aside from platelets in the weeks after a nuclear detonation, but institutional and regional shortfalls may exist for brief periods)

The cardset Strategies for Scarce Resource Situations can help providers anticipate and managing these shortages. To summarize, when anticipating or faced with a resource shortfall, providers can focus on these six strategies to ensure a response that is as robust and effective as possible:

- **Prepare**: Optimally, planning can identify and mitigate resource shortfalls by encouraging stakeholders to stockpile commonly needed (and often inexpensive) items such as morphine and intubation equipment. Preparation also includes practicing methods to maintain the equipment and supplies; for example, adherence to preventative maintenance, stock rotation, and restocking schedules.
- **Conserve**: In the event of a shortfall, place restrictions on the use of certain therapies or interventions to maintain supply (for example, N95 masks, oxygen).
- **Substitute:** Use a functionally equivalent medication or device (for example, using benzodiazepines instead of propofol for sedation of a tracheally intubated patient).
- **Adapt**: Use of a device for purposes for which it was not intended (for example, using an anesthesia machine or Bi-level positive airway pressure machine as a temporary ventilator, or using an oxygen saturation monitor with high/low rate alarms instead of a cardiac monitor to detect tachy or bradydysrhythmias).

- **Reuse**: After appropriate cleaning, disinfection, or sterilization, the majority of material resources can be reused.
- **Reallocate**: Certain critical resources (e.g., ventilators, extracorporeal membrane oxygenation) may have to be allocated to those patients most likely to benefit. In extreme situations this may involve removal of these resources from one patient to give to another patient with a substantially better chance of a good outcome. This, clearly, is a last resort and should be done only when no other options exist.

## Triage

This table shows the differences between reactive and proactive triage situations (Hick, Hanfling, and Cantrill 2012):

**Table 2**

Differences between reactive and proactive triage situations.*

| | Reactive | Proactive |
|---|---|---|
| Incident type | Early in event period. Often no-notice event (often static or short timeline) (eg, earthquake, bombing) | Later in no-notice event or anticipated, often dynamic event (eg, pandemic influenza) |
| Incident management implemented fully? | No (full implementation is transition point to proactive) | Yes |
| Situational awareness | Poor | Good |
| Resource availability | Extremely dynamic (during hours) | Relatively static |
| Resource shortfall(s) | Stabilization care through definitive | Definitive care, select medications or therapies |
| Dominant triage | Primary, secondary | Tertiary |
| Most likely resource triaged | Operative care (may not be able to provide any operative care if massive event), diagnostic imaging, fluid resuscitation | Mechanical ventilation/critical care (improvised nuclear device is an exception because of delayed radiation illness) |
| Triage decisionmaker | Triage officer(s) on initial assessment at bedside | Triage team not involved with patient's care |
| Triage decision basis | Clinical assessment | Clinical plus diagnostics (decision tool) |
| Decisionmaking | Unstructured, ad hoc | Structured |
| Regional and state guidance and legal protections/emergency declarations needed | No | Yes |

* Modified from Table 7, Institute of Medicine, used with permission.[7]

All disaster triage decisions must be based upon an ethical framework. Core components of ethical decision making include:

- **Fairness**: The process is inherently just to all individuals, and the process itself treats all individuals (who have equal needs) equally.

- **Duty to care**: Physicians have a duty to care as best they can for all victims of the incident.
- **Duty to steward resources**: Physicians have a duty to attempt to obtain the best outcome for the greatest number of patients with the resources available (this does not specifically translate to "save the most lives" because a comfortable death may be considered a good, resource-eligible outcome ).
- **Transparency**: Though difficult in reactive triage decisions, the process and criteria should be as transparent as possible.
- **Consistency**: The process should be applied in the same way to all presenting for care.
- **Proportionality**: The degree of resource restriction should be proportional to the demands.
- **Accountability**: Triage officers and others should be able to defend their triage and treatment decisions . This may involve documentation and potential review of decisions by the institution and possibly outside agencies.

## Specific Considerations for Radiological/Nuclear Incidents

The table that follows provides preparation, triage, and treatment considerations for different types of incidents (Hick, Hanfling, and Cantrill 2012):

**Table 6**

Specific considerations for crisis care.

| | Prepare | Triage | Treat |
|---|---|---|---|
| Chemical | Stock additional airway management supplies and at minimum, bulk or other supplies of atropine.[69] | Acid-gas exposure: upper airway obstruction=high priority (those in cardiac arrest likely unsalvageable as primary respiratory process).<br>Those with mild symptoms usually will not progress (exception: phosgene and similar).<br>Cardiac arrest from cholinergic/other; may have good outcomes, provide interventions if resources available. | Antidotal treatment as indicated.<br>Emphasis on atropine for cholinergic syndrome treatment.<br>Airway management for airway irritants; usually temporary requirement for mechanical ventilation. |
| Burn | Stock analgesia, sedation, intravenous fluids, burn dressing alternatives (Table 1). | Burn triage category heavily influenced by body surface area and age. Consider use of burn triage table,[45] which may be used in conjunction with overall clinical assessment | Early airway management if possible.<br>Early and aggressive analgesia.<br>Escharotomy as required.<br>Consider sterile sheet wraps rather than dressings initially.<br>Further wound care as circumstances permit. |
| Blast | Stock analgesia, intravenous fluids, sodium bicarbonate, broad-spectrum antibiotics, surgical trays, tetanus immunizations. | Open head injury with coma nearly universally fatal.[31, 70, 71]<br>Multiple amputations or extremity mutilation, coma, persistent hypotension predict high mortality.[71]<br>External hemorrhage control and internal isolated hemorrhage because of shrapnel most likely to survive with time-limited interventions.[31] | Tourniquets and compression bandages for hemorrhage control.<br>Airway management.<br>Intravenous fluids.<br>Splinting of unstable limbs.<br>Watch for evolving chest/abdominal pathology in patients with significant injuries, especially in confined space blast injury or with evidence of other barotrauma. |
| Radiation/nuclear device* | Analgesia, antiemetics, antidiarrheals, cytokines†† | Do not use vomiting as early triage indicator; nonspecific.[72]<br>Usual trauma triage principles apply until radiation exposure can be defined.<br>Combined injury (radiation plus trauma or radiation plus thermal burns) dramatically increases mortality (animal model of 2-Gy radiation and 10% BSA burn=90% mortality).[75] | See published resources[73, 74] for clinical guidance.<br>Cytokines (eg, G-CSF) should be administered as early as possible, with use restricted as necessary to patients most likely to survive. |

* This does not apply to radiologic dispersion devices, which release a fraction of the radiologic material and are unlikely to cause significant numbers of patients with acute radiation sickness.[74]
† National stockpile of cytokines exists; some regions have elected to maintain additional stocks. Extremely expensive; relatively short shelf life limits stockpiling. Benefits unclear but presumed in setting of pancytopenia related to acute radiation sickness.

## Additional Resources

ASPR TRACIE. (2015). ASPR TRACIE Crisis Standards of Care Topic Collection.
The provision of medical care under catastrophic disaster conditions requires considerable pre-event planning, along with the recognition that the delivery of healthcare services will likely change due to the potential scarcity of required resources.

The resources in this Topic Collection can help healthcare providers create and update effective crisis standards of care plans.

Hanfling, D., Hick, J., and Stroud, C. (2013). Crisis Standards of Care: A Toolkit for Indicators and Triggers. Institute of Medicine, Washington, DC: National Academies Press.

This toolkit contains key concepts, guidance, and practical resources to help individuals across the emergency response system develop plans for crisis standards of care and respond to a catastrophic disaster. It includes sample indicators, triggers, and sample tactics for use in the transition from conventional surge to contingency surge to crisis surge, and a return from crisis response to conventional response.

Hick, J.L., Hanfling, D., and Cantrill, S.V. (2012). Allocating Scarce Resources in Disasters: Emergency Department Principles. Annals of Emergency Medicine. 59(3): 177-187.

The authors summarize key elements contained in the Institute of Medicine work on crisis standards of care. Written for the emergency medicine community, this paper is intended to be a useful adjunct to support discussions related to the planning for large scale disaster events.

### Foundational Crisis Standards of Care Documents

The 2012 Crisis Standards of Care publication developed by the Institute of Medicine (IOM) of the National Academies serves as a key CSC foundational document. It includes seven volumes that provide discipline-specific recommendations and assessment tools for CSC planning. States, regions, locals, and healthcare facilities should utilize the guidance provided in the IOM reports, specifically C*risis Standards of Care: A Systems Framework for Catastrophic Disaster Response*, to help develop an operational CSC plan.

- Volume 1, Chapter 2 provides an overview of the CSC framework and planning milestones when developing a plan.
- Volume 1, Chapter 3 provides the legal issues in emergencies that would impact allocation of resources and establishment of CSC.
- Volume 2- State and Local Government
- Volume 3- Emergency Medical Services
- Volume 4- Hospitals- includes the roles/responsibilities of health care facilities and operational considerations.
- Volume 5- Alternate Care Systems
- Volume 6- Public Engagement

## Best Practice Plans

The following CSC documents are recommended as “promising/best practices” in that they address a number of the elements noted in the IOM report:

- Washington DC: Modified Delivery of Critical Care Services in Scarce Resource Situations, Overview of a strategy to be implemented by the DC Emergency Healthcare Coalition and its member organizations

    - Page 3: Tiered approach to modified healthcare delivery in scarce resource situations
    - Page 18: Modified Delivery of Critical Care Services: Preparedness Considerations
- Minnesota:
    - Patient Care: Strategies for Scarce Resources Situations- decision support tool to be used by key personnel, along with incident management.
    - Ethically Rationing Health Resources in Minnesota in a Severe Influenza Pandemic
    - Science Advisory Team Crisis Standards of Care Charter
- Hennepin County, MN: (obtain from ASPR TRACIE):
    - Hennepin County Medical Center (HCMC) Crisis Standard of Care Guidelines-Draft September 14, 2009.
    - HCMC Disaster Surge Capacity Plan (2015)
- Arizona Department of Health Services. Arizona Crisis Standards of Care Plan: A Comprehensive and Compassionate Response.
    - Page 19: Indicators for CSC Activation
    - Page 23: Healthcare facility scripted tactics for CSC

## III. Decontamination – Specific to Radiation

According to the CDC document A Guide to Operating Public Shelters in a Radiation Emergency, Chapter 3 and Appendix D, if radioactive contamination exceeding the established criterion is detected, the person exhibiting the contamination will need to be cleaned before entering the shelter clean zones. Decontaminating a person can be as simple as removing an article of clothing or it can require multiple showers or special techniques to remove stubborn contamination. In general, people can be cleaned as if they were covered in dust or mud.

If running water is available:

- People should decontaminate by carefully removing their outer layer of clothing and showering or washing exposed skin at a sink. Individuals who are unable to perform these tasks by themselves will require personal assistance.

If running water is NOT available:

- People should carefully remove their outer layer of clothing and decontaminate exposed skin with moist wipes or damp towels, or use other dry decontamination techniques. Individuals who are unable to perform these tasks by themselves will require personal assistance.
- Dry decontamination techniques may also include using tape or lint rollers to remove visible dust from clothing or skin.

Additional resources follow.

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

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

ASPR TRACIE. (2016). Hospital Victim Decontamination Topic Collection.

The release of hazardous materials—whether accidental or intentional—has the potential to significantly harm the health of community members and first responders. No matter the cause, patients will require emergent medical care delivered by a team of healthcare providers. Because of the significant draw on human and material resources associated with these incidents, it is critical for emergency medical professionals to develop hospital victim decontamination plans that can help them provide the best medical care possible to patients while ensuring that caregivers are protected. The following resources highlight lessons learned, guidelines, plans, tools, and templates, and promising practices that can help emergency medical practitioners accomplish this goal.

Radiological specific decontamination resources are also available under a separate heading in the Hospital Victim Decontamination Topic Collection.

ASPR TRACIE. (2016). Pre-hospital Victim Decontamination Topic Collection.

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

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

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

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

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

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

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

## IV. Disaster Behavioral Health

Radiological emergencies are frightening for most people. The health effects, exposure risk, and general recovery from these events are not well understood by the general public and these events will likely cause significant psychological stress on people across the world. Past events provide some information on how the general public will react to radiological emergencies and ensuring a disaster behavioral health program is in place along with a rapidly deployed risk communication program can explain the exposure and risks and calm the fears of those within and outside of the affected area.

Resources related to disaster behavioral health (DBH) planning and considerations specific to radiological emergencies are included below.

ASPR TRACIE. (2017). Disaster Behavioral Health: Resources at Your Fingertips.

This document provides information on and links to select DBH programs and resources. This is not meant to be a comprehensive list, but a selection of programs and resources that can be of immediate use to emergency healthcare providers, emergency management stakeholders, and other professionals and survivors affected by naturally-occurring or human-caused incidents.

ASPR TRACIE. (2017). Mental/Behavioral Health (non-responders) Topic Collection

This Topic Collection addresses the impact of post-disaster mental and behavioral health-related challenges on the healthcare system. The resources in this Topic Collection can help healthcare systems enhance their ability to prepare for and respond effectively to the mental and behavioral health complications that may arise during an emergency.

Becker, S. (2013). From Radiological Incidents to Nuclear Calamities: Social, Behavioral, and Risk Communication Issues in Radiation Emergencies.

This 69 minute audio/video recording of a presentation was posted by the Institute of Disaster Mental Health. The goal of the training was to increase the knowledge base among emergency and disaster response personnel, as well as the general public, about the probability, effects, and consequences of radiological disasters and the importance of clear risk communication before, during, and after an event.

Bromet, E. (2014). Emotional Consequences of Nuclear Power Plant Disasters. Health Physics. 106(2): 206-210.

This article describes the emotional consequences and resilience of two groups of nuclear power plant disaster survivors: mothers of young children and nuclear plant workers. The authors stress the need for considering physical and mental health "in an integrated fashion," the need for more long-term research, and the need for healthcare providers to be able to recognize and manage psychological symptoms.

Centers for Disease Control and Prevention. (2010). Psychological First Aid in Radiation Disasters.

This self-study training is geared towards healthcare professionals and others involved in planning for mass casualty response to radiation emergencies. It includes interviews with experts involved in the Goiania and Three Mile Island incidents and video scenarios that allow participants to observe how psychological first aid techniques can be employed in a variety of response settings.

Moskowitz, S. (n.d.). Disaster Mental Health: Assisting People Exposed to Radiation. (Accessed 4/27/2017.)

This presentation describes the prominent psychosocial issues related to radiological exposure, examines the evidence-based psychosocial interventions, including effective risk communication practices, and identifies key elements of self-care for first responders and public health professionals.

## V. Radiological and Nuclear Specific Resources

The HHS Radiation and Emergency Medical Management (REMM) site provides guidance for health care providers, primarily physicians, about clinical diagnosis and treatment of radiation injury during radiological and nuclear emergencies. It aims to provide just-in-time, evidence-based, usable information with sufficient background and context to make complex issues understandable to those without formal radiation medicine expertise. Here are a few recommended “first stops” within the site:

- Learn about radiation basics
- Radiation incidents (includes discovering an incident, characterizing severity, timeline, specific incident types, nuclear explosions, and public messages)
- Information for first responders in the field
- Information for preparedness and response planners

### Quick Links for Radiation Information

- Acute Radiation Syndrome: A Fact Sheet for Clinicians
- Communication and Public Information in Radiation Disasters
- Radiation and Emergency Medical Management (REMM)
    - Triage Guidelines
    - Radiation Algorithms
    - On-Scene Management
    - Victim Transport

    - Hospital Medical Orders During a Radiation Incident
    - Hospital Activities
- Radiological Terrorism: Emergency Management Pocket Guide for Clinicians
- Radiological Terrorism: Just in Time Training for Hospital Clinicians

ASPR TRACIE. (2016). Radiological and Nuclear Topic Collection

The resources in this Topic Collection include toolkits, reference guides, plan guidance documents, modeling and simulation reports, and manuals that may help first responders and first receivers assess, triage, and treat casualties of radiological and nuclear emergencies.

## VI. Responder Safety and Health

Guidance on REMM for Personal Protective Equipment in Radiation Emergencies includes:

- In a radiation emergency, the choice of appropriate personal protective equipment (PPE) depends on
    - Response role and specific tasks
    - Risk of contamination
- PPE can protect against
    - External contamination
    - Internal contamination via inhalation, ingestion, absorption through open wounds
    - Other physical hazards (e.g., debris, fire/heat, or chemicals)
- PPE **cannot** protect against exposure from high energy, highly **penetrating** forms of ionizing radiation associated with most radiation emergencies.
    - Lead aprons worn in diagnostic radiology do not provide sufficient shielding against these kinds of radiation.
    - See Types of Ionizing Radiation and Shielding Required
- PPE should include a personal radiation dosimeter whenever there is concern about exposure to penetrating ionizing radiation.
    - Direct-reading personal radiation dosimeters may be used to monitor radiation dose and can help workers stay within recommended Dose Limits for Emergency Workers.
    - Direct-reading dosimeters should be worn so that a worker can easily see the read-out and/or hear warning alarms.
- Recommended respiratory PPE includes a full-face piece air purifying respirator with a P-100 or High Efficiency Particulate Air (HEPA) filter.
    - Other respiratory protective equipment (e.g., a simple surgical facemask, N-95 respirators), non-fit tested respirators, or ad hoc respiratory protection do not deliver appropriate or sufficient respiratory protection.

Environmental testing and hazard assessment by a safety professional can help identify hazards and risk levels and direct choices of permissible PPE.

Additional resources follow.

ASPR TRACIE. (2016). Responder Safety and Health Topic Collection

> The resources in this Topic Collection focus on safety strategies (e.g., preventing fatigue, ensuring the availability and correct use of personal protective equipment) and maintaining behavioral health (e.g., working through stress and preventing/addressing compassion fatigue).

ASPR TRACIE. (2016). Tips for Retaining and Caring for Staff after a Disaster.

> This tip sheet provides general promising practices—categorized by immediate and short-term needs—for facility executives to consider when trying to retain and care for staff after a disaster.

## VII. Scarce Resources Considerations for Nuclear Incidents

Numerous considerations need to be taken into account when resources are likely to become limited during and after a disaster/emergency.

Scarce Resources- This link is to the full triage module on REMM which provides users with access to the information listed below and to an online flowchart/decision tree for complex triage decisions. This set of resources provides the background information on triaging and medically managing patients in the early days following a radiological event. The online triage tool allows for data entry and customization of decision-making.

- Use triage tool online
- Download triage tool for use offline by downloading REMM
- Print triage tool cards (PDF - 664 KB)
    - Download Mobile REMM which includes "Scarce Resources Triage Tool"
    - Read Scarce Resources Triage Tool Disclaimer information

> "Ethical and operational principles on which medical interventions provided may be adjusted according to demand and the resources available. Incidents may require a range of responses from an institution and providers, from conventional (maximal use of usual space, staff, and supplies) to contingency (use of other patient care areas and resources to provide functionally equivalent care) and crisis (adjusting care provided to the resources available when usual care cannot be provided). This continuum is defined and may be helpful when determining the scope of response and assistance necessary in an incident."
>
> (Hick, Hanfling, and Cantrill 2012).

Additional resources follow.

- Allocation of Scarce Resources After a Nuclear Detonation: Setting the Context.
- Casagrande R., Wills N., et al. (2011). Using the Model Of Resource and Time-based Triage (MORTT) to Guide Scarce Resource Allocation in the Aftermath of a Nuclear Detonation. Disaster Med Public Health Prep. 5 Suppl 1:S98-110.
- Coleman C., Casagrande R., Hick J., et al. (2011). Triage and Treatment Tools for Use in a Scarce Resources - Crisis Standards of Care Setting following a Nuclear Detonation. Disaster Med Public Health Prep. 5 Suppl 1:S111-21.
- Dodgen D., Norwood A., et al. (2011). Social, Psychological and Behavioral Responses to a Nuclear Detonation in a US City: Implications for Healthcare Planning and Delivery. Disaster Med Public Health Prep. 5 Suppl 1:S54-64.

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- Murrain-Hill P., Coleman C., Hick J., et al. (2011). Medical Response to a Nuclear Detonation: Creating a Playbook for State and Local Planners and Responders. Disaster Med Public Health Prep. Suppl 1:S89-97.
    - Complete State and Local Playbook online (HHS/ASPR)
- Radiation Injury After a Nuclear Detonation: Medical Consequences and the Need for Scarce Resources Allocation.
- Resource Allocation After a Nuclear Detonation Incident: Unaltered Standards of Ethical Decision Making.
- Scarce Resources for Nuclear Detonation: Project Overview and Challenges.
- Sherman, S. (2011). Legal Considerations in a Nuclear Detonation. Disaster Med Public Health Prep. 5 Suppl 1:S65-72.

## VIII. Other Resources

ASPR TRACIE. (2016). HIPAA and Disasters: What Emergency Professionals Need to Know.

> Disasters and emergencies can strike at any time with little or no warning and the local healthcare system in the midst of an emergency response can be rapidly inundated with patients, worried family and friends looking for their loved ones, and media organizations requesting patient information. Knowing what information can be released, to whom, and under what circumstances, is critical for healthcare facilities in disaster response. This guide is designed to answer frequently asked questions regarding the release of information about patients following an incident.

ASPR TRACIE. (2016). Mass Burn Event Overview Document.

> This document provides guidance for healthcare coalitions, burn centers, state public health preparedness professionals, healthcare entities, and other stakeholders planning for a burn mass casualty incident.

Other Potentially Relevant ASPR TRACIE Topic Collections:

Access and Functional Needs (e.g., at-risk populations, vulnerable populations, CMIST)
Alternate Care Sites (including shelter medical care)
Burn
Disaster Ethics
Disaster Veterinary Issues
Emergency Public Information and Warning/Risk Communications
Explosives (e.g., bomb, blast) and Mass Shooting
Family Reunification and Support
Fatality Management
Healthcare Facility Evacuation / Sheltering
Healthcare-Related Disaster Legal/ Regulatory/ Federal Policy
Hospital Surge Capacity and Immediate Bed Availability
Incident Management
Patient Movement and Tracking

Pediatric
Pre-Hospital
Recovery Planning
Virtual Medical Care