Use of Non-Pharmaceutical Interventions (NPIs) Following a Dirty Bomb Explosion

Part 1: Basic Information and Guidance

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Part 1

Basic Information and Guidance
Introduction: Dirty Bombs and NPIs

A dirty bomb is made up of conventional explosives plus radioactive material. It is also known as an explosive radiation dispersal device (RDD). A dirty bomb explosion would have two direct effects:

1. The explosion itself could cause serious injury and death to those nearby, as well as damage to buildings, vehicles, and other environmental structures.

2. The explosion would also disperse radioactive material along with dust that may contain radioactive material into the air where the wind could carry it for a distance of several blocks to miles. As the radioactive material falls to earth, it can contaminate the environment (buildings, vehicles, road surfaces, etc.), as well as people, animals, and plants.

The magnitude of the bomb’s effects on both people and the environment, as well as the exact nature of the response to the incident, would be directly affected by a number of factors such as the size and construction of the bomb, the type of explosive used, where and when the explosion occurred, the amount of radioactive material in the bomb, the specific radioisotope(s) used, and local weather conditions. More information on dirty bombs and the response to a dirty bomb explosion is found in Appendix A.

The main immediate medical consequences following a dirty bomb explosion will be traumatic injuries/burns, and the psychological effects related to the incident (including concerns about exposure to radiation). Acute radiation-induced illness (i.e., acute radiation syndrome, or ARS) could be a concern for individuals very near the blast site if radiation exposure levels are significant. The number of persons experiencing ARS is not expected to be large, but these individuals will need medical evaluation/treatment. On the other hand, many persons in the affected areas may have at least some degree of external contamination with radioactive material, and some may also have internal contamination.

A basic explanation of radiation hazards and a summary of the medical management of radiation victims are provided in Appendix B. Appendix C outlines key elements in the medical response to a dirty bomb explosion.

All individuals with external contamination should undergo decontamination, which could take place at a variety of locations. Persons who have had external contamination should also be evaluated for internal contamination. If levels of internal contamination are estimated to be significant, treatment with medical countermeasures may be recommended (note that decisions here will also have to take into account the radioisotope[s] involved, the number of persons affected, the amount of resources available, and possibly additional factors). Individuals who have experienced significant internal contamination and/or external radiation exposure may need to have continued medical follow-up because of a possible increased risk for developing cancer years to decades later.

In the aftermath of a radiological incident such as a dirty bomb explosion, the emphasis should be on minimizing individuals’ exposure both to external radiation and to contamination (both externally and internally) with radioactive material. This can be achieved through the use of timely and appropriate protective actions which can, in general, be considered as non-pharmaceutical interventions (NPIs). By minimizing or preventing external radiation exposure and contamination with radioactive material, the risk of acute radiation-induced illness (i.e., ARS), as well as later adverse health consequences such as cancer, can be minimized or avoided, as can the need for pharmaceutical countermeasures.

It is important to keep in mind that many people see radiation as mysterious and very frightening. A dirty bomb explosion could cause considerable fear and anxiety, and response efforts will have to address this reality. At the same time, it should be made clear that radiation is one of the most thoroughly studied and best understood health hazards, and that the basic actions to take following a radiological incident are well known. If these actions are quickly instituted, the public’s exposure to radiation can be minimized and the chances of adverse health effects greatly reduced.

For further information on dirty bombs, see http://health.mo.gov/emergencies/ert/med/nucbook.php. Detailed information on radiological/nuclear issues is available at http://health.mo.gov/emergencies/ert/nucmed.php. A glossary of radiation-related terms is reproduced in Appendix D.
This document is divided into two parts, each of which is broken into sections:

- **Part 1: Basic Information and Guidance**
  - **Introduction:** Dirty Bombs and NPIs
  - **Section 1** describes specific NPIs that can be used following a dirty bomb explosion. Included are NPIs for individuals, and also NPIs that can be instituted at the community level. Note that the listing of NPIs here is not necessarily chronological in the sense that #1 would be done first, followed by #2, and so on. Instead, many of these actions would need to be taken simultaneously. Be aware that additional interventions might be undertaken as part of the response to a specific incident.
  - **Section 2** provides examples of messages to the public that could be utilized following detection of a dirty bomb incident (note that these messages may need to be modified to fit the specific situation). Should a dirty bomb explosion occur, it is imperative that information and guidance be quickly provided to the public so they can take appropriate actions to protect themselves from radioactive contamination and radiation exposure. Local emergency response officials should have draft messages already developed which can, should a dirty bomb incident occur, be quickly updated as necessary based on the situation, and then immediately disseminated to the public.
  - **Section 3** contains tables which specifically relate to the Missouri Department of Health and Senior Services’ (DHSS’) preparation for, and response to, a dirty bomb incident. The first two tables describe steps that DHSS can take to prepare to respond to a dirty bomb incident. The next two tables summarize the expected response to a dirty bomb incident, and list some of the potential issues that would need to be addressed by DHSS programs and staff. Local jurisdictions may consider developing similar tables addressing their own preparations for, and expected responses to, this type of incident.

- **Part 2: Additional Information and Reference Material**
  - **Section 4** describes in more detail the NPIs that were summarized in Section 1.
  - **Section 5** briefly describes the relationship of NPIs to medical/pharmaceutical interventions in the context of a radiation event.
  - **Section 6** provides information on statutory/regulatory authorities that might be applicable during the response to a dirty bomb incident.
  - **Section 7** contains appendices that provide additional information on dirty bombs and the response to a dirty bomb incident.
    - Appendix A – Dirty Bombs and the Response to a Dirty Bomb Explosion
    - Appendix B – Radiation Hazards and Medical Management of Radiation Victims
    - Appendix C – Medical Response to a Dirty Bomb Explosion
    - Appendix D – Glossary of Radiological Terms
    - Appendix E – Guiding Principles in Planning for the Response to a Radiation Incident
    - Appendix F – Flow Chart for Responding to a Radiological Dispersal Device (RDD)
    - Appendix G – Providing Accurate, Timely Public Information During a Radiological Incident
Section 1

Summary of Individual and Community-Level Non-Pharmaceutical Interventions (NPIs) Following a Dirty Bomb Explosion

Section 1 describes specific NPIs that can be used following a dirty bomb explosion. Included are NPIs for individuals, and also NPIs that can be instituted at the community level. Note that the listing of NPIs here is not necessarily chronological in the sense that #1 would be done first, followed by #2, and so on. Instead, many of these actions would need to be taken simultaneously. Be aware that additional interventions might be undertaken as part of the response to a specific incident.

The material in this section can be utilized for:

- Education of emergency response and public health officials, public information officers, governmental decision-makers, and others who will be involved in planning for and/or responding to a dirty bomb incident.

- Development of written plans and protocols addressing the preparation for, and response to, the explosion of a dirty bomb.

- Development of guidance and instructions for the public to follow after a dirty bomb incident. (Note that Section 2, below, contains specific examples of brief messages that could be utilized in communicating this information to the public in the immediate aftermath of a dirty bomb explosion.)
Summary of Non-Pharmaceutical Interventions (NPIs) Following a Dirty Bomb Explosion

A. Interventions for Individuals

1. Follow all recommendations of emergency response/public health officials.

2. Be aware of, and seek to avoid, non-radiation dangers in the area of the explosion. The following recommendations would generally apply in many types of explosion incidents regardless of whether or not radioactive materials are involved. However, one’s actions must always be tailored to the particular situation. Also, keep in mind that it will not be immediately known whether radioactive materials are present (i.e., whether the explosion was due to a dirty bomb).

   • If in a building where an explosion has occurred:
     - Immediate actions:
       - Get under a sturdy table or desk if objects are falling around you.
       - Cover your nose and mouth with anything available to limit inhalation of dust or other hazardous materials. Dense-weave cotton material can act as a good filter.
       - Stay away from possible bomb parts or materials.
       - Exit as quickly as this can be done. Assist other victims to leave the area if possible. Use stairs instead of elevators.
       - Be aware of weakened floors and stairways, and watch for falling debris.
     - Once you are out of the building:
       - Continue to cover your nose and mouth.
       - Move away from windows, glass doors, or other potentially hazardous areas.
       - Stay away from possible bomb parts or materials.
       - Be aware that secondary explosions may occur at or near the original bombing site.
       - Use caution to avoid debris that could be hot or cause puncture wounds.
       - Continue moving away from the immediate blast site. Look and listen for instructions from on-scene emergency responders/local authorities.
       - Do not eat, drink, or smoke in order to lower the possible risk of taking toxic material into your body.
       - Limit your use of cell phones and other communications devices as much as possible because communications systems may become overloaded.
       - If no guidance is immediately available from emergency responders or local officials, move to an inner area of a non-damaged building, away from windows and doors, until directed differently by authorities.
         - If there is concern about dust or other hazardous materials in the air from the explosion, continue to cover your nose and mouth with anything available.
- Listen for instructions from emergency responders, and from local officials on TV/radio.
- Continue to limit your use of cell phones and other communications devices as much as possible.
- At least initially, do not eat, drink, or smoke. Local officials should provide further instructions.

- **If trapped:**
  - Cover your nose and mouth with anything available to limit inhalation of dust or other potentially hazardous materials.
  - Avoid unnecessary movement so you don’t kick up dust.
  - Signal your location to rescuers using any appropriate means available.
  - Shout only as a last resort. Shouting can cause you to inhale dangerous amounts of dust/toxic materials, and will drain your energy.

- **If in a building nearby to where an explosion has occurred:**
  - Follow, to the extent they are relevant, the instructions provided above, except do not exit the building unless directed to do so by emergency responders or local officials, or there is a specific reason to do so (e.g., the building is filling with smoke, there is a question about its structural integrity, etc.). If staying in the building (i.e., sheltering in place), move to an inner area, away from windows and doors, until directed differently by authorities.
  - If there is concern about dust or other hazardous materials in the air from the explosion, cover your nose and mouth with anything available to limit inhalation of these materials. Dense-weave cotton material can act as a good filter.
  - Listen for instructions from emergency responders, and from local officials on TV/radio.
  - Limit your use of cell phones and other communications devices as much as possible because communications systems may become overloaded.
  - At least initially, do not eat, drink, or smoke in order to lower the possible risk of taking toxic material into your body. Local officials should provide further instructions.

- **If outside near where an explosion has occurred:**
  - Cover your nose and mouth with anything available to limit inhalation of dust or other hazardous materials. Dense-weave cotton material can act as a good filter.
  - Assess the environment around you before taking any action. Stay away from possible bomb parts or materials.
  - Avoid being lured closer to see what is happening because the risks from secondary attacks or hazardous materials could be extremely high.
  - Listen for, and follow, instructions from on-scene emergency responders/local authorities.
  - Limit your use of cell phones and other communications devices as much as possible because communications systems may become overloaded.
  - Do not eat, drink, or smoke in order to lower the possible risk of taking toxic material into your body.
  - If no guidance is immediately available from emergency responders or local officials, move to an inner area of a non-damaged building, away from windows and doors, until directed differently by authorities.
    - If there is concern about dust or other hazardous materials in the air from the explosion, continue to cover your nose and mouth with anything available.
    - Listen for instructions from emergency responders, and from local officials on TV/radio.
    - Continue to limit your use of phones and other communications devices as much as possible.
    - At least initially, do not eat, drink, or smoke. Local officials should provide further instructions.
3. Once the presence of radioactive material is detected, avoid, or minimize, contact with this material. Actions in addition to those mentioned above include:

- Do not go into the area of the explosion unless one is a responder utilizing appropriate personal protective equipment (PPE) and with appropriate radiological monitoring/dosimetry in place.

- If this has not already been done, go inside, or remain inside, a non-damaged building to minimize exposure to radioactive dust, debris, and smoke (unless instructed by authorities to take other actions).

- Avoid touching suspected contaminated surfaces. Keep hands away from the face (especially the mouth) until one has undergone decontamination and there is no radioactive contamination in the immediate environment.

- If skin or clothing is, or might be, contaminated with radioactive material, as soon as possible carefully remove outer clothing and place in a plastic bag (e.g., a garbage bag). Undergo decontamination (see below).

- Avoid (unless one is an emergency responder/medical provider with appropriate PPE) direct physical contact with persons whose skin, hair, or clothing may be contaminated with radioactive material until they have been adequately decontaminated.

- Evacuate the area if told to do so by emergency response/public health officials.

- Emergency responders and medical personnel should always use appropriate PPE and personal dosimetry. Radiation exposure should be closely monitored and appropriate radiation exposure guidelines followed.

- Exercise caution in caring for persons who were close to the explosion and received shrapnel wounds (the shrapnel could be radioactive).

4. Undergo decontamination as soon as this is possible if external contamination is known or suspected to have occurred. Persons with external contamination should undergo evaluation for internal contamination.

- Decontamination normally includes careful removal (and bagging) of clothing plus showering with warm (not hot or cold) water and soap, followed by putting on clean, non-contaminated clothing.

- If unable to immediately shower, remove outer clothing and, if water is available, wash hands, face, and other exposed areas (i.e., areas which had not been covered by clothing), or wipe with moist towels or disposable baby wipes. Then shower as soon as possible.

- Decontamination can occur at special decontamination sites that may be set up by emergency response officials. Decontamination can also occur at home, at a Community Reception Center (CRC), or (for those who are injured or sick) at a medical care facility.

- If undergoing self-decontamination at home, follow guidance that will be provided by local officials. Included here would be instructions to remove and bag clothing before entering the house (e.g., in the garage using a garbage bag). Individuals will also be told to listen to local TV/radio stations for further instructions.

- Affected persons may be told to go, within the next few days, to a Community Reception Center (CRC) for evaluation, additional decontamination (if needed), and any necessary referrals for additional care/follow-up. (See below for more information on CRCs.)

5. If injured by the explosion, seek (or be transported to) medical care.

6. If uninjured but near the explosion site, contact a medical provider or (once local officials indicate it is safe to do so) seek medical evaluation if acute radiation syndrome (ARS) symptoms (e.g., nausea, vomiting) develop. Persons who are asymptomatic and uninjured should not go to an emergency room to be evaluated for radiation exposure/radioactive contamination. If necessary, evaluation can occur at a CRC once it is set up.

7. If recommended to do so by local public health/emergency response officials, go to a CRC for assessment/monitoring (including evaluation for external and internal contamination) and, if needed, further decontamination. The CRC will also provide, as necessary, referral for additional medical care and follow-up. In addition, education will be provided and questions can be addressed.
B. Interventions at the Community Level

1. Properly manage the scene of the explosion, including radiation monitoring, establishment of safe areas/zones of response, triage and initial medical treatment of the injured, and transport of the injured to a medical facility. Conduct screening and decontamination of individuals as resources allow, or provide instructions for home decontamination. Among the specific actions that should be taken whenever it is discovered that an explosion has released radiation/radioactive materials into the environment are the following (some of these actions have likely already been initiated as part of the initial response to the explosion):

   - Establish Incident Command if this has not already been done.
   - Contact appropriate authorities, including local/state radiation control programs.
   - Ensure the safety of personnel responding to the incident (e.g., PPE, personal dosimeters).
   - Control the scene and establish safe areas/zones of response. Continuously measure levels of radiation throughout the area.
   - Closely monitor the radiation exposure of responders. Follow radiation exposure guidelines.
   - Rescue the injured.
   - Establish patient handling flows. Provide triage, emergency treatment, and transport of the injured to a medical facility.
   - Screening victims for radioactive contamination, as well as providing decontamination, should be done if feasible.
   - In some instances, persons not needing immediate medical attention may be sent home to self-decontaminate and listen to local media for further information and guidance.
   - If injuries are life-threatening, or if there is a serious, acute medical condition, the person should be treated without regard for contamination and transported to a hospital where they should be immediately admitted if this is necessary for life-saving care.
   - If the person has non-life-threatening injuries but is contaminated, decontaminate before sending to medical care.
   - If rapid decontamination by showering cannot be quickly done, people can take other steps by themselves without showering to markedly minimize the levels of external contamination and the likelihood of internal contamination. These steps could include removal of outer clothing and, if water is available, washing of the hands, face, and other exposed areas, or wiping of these areas with moist towels or disposable baby wipes. Then, as soon as this can be done, these individuals should shower with soap and warm water.
   - Record contact information on all persons released from the scene.

2. Provide rapid, accurate, and useful information and guidance to: 1) the public, 2) medical providers, 3) responders, 4) public health officials, 5) elected leaders and other decision-makers, and 6) other affected persons or groups.

   a. Examples of messages for the public are shown below in Section 2 (note that these messages may need to be modified to fit the specific situation). It is imperative that information and guidance be quickly provided to the public so they can take appropriate actions to protect themselves from radioactive contamination and radiation exposure. Local emergency response officials should have draft messages already developed which can, should a dirty bomb incident occur, be quickly updated as necessary based on the situation, and then immediately disseminated to the public.

   b. Provide periodic updates as new information and guidance become available.

   c. It is important that any communications be provided in appropriate languages and literacy levels for the recipients. Consider the use of visuals, universal signage, or videos.

   d. One particular priority is to keep persons who do not need immediate medical care from overburdening local and area hospitals.

3. Decide on, and rapidly and effectively communicate, recommendations for sheltering in place and/or evacuation. Provide assistance to those who need it in order to carry out these recommendations.
4. Set up a shelter(s) for evacuated (and relocated) persons.

5. Conduct ongoing monitoring of the environment with radiation detection equipment. Use the data obtained, in conjunction with appropriate Protective Action Guides (PAGs), in managing the situation – including decisions regarding evacuation/sheltering in place, stay times for responders, relocation of persons living in certain contaminated areas, and remediation of the environment.

6. Restrict movement and/or certain activities within affected areas as needed.

7. Protect responders, medical personnel, and others who may have contact with contaminated environments and/or persons.
   a. Ensure appropriate PPE and personal dosimeters are utilized.
   b. Appropriately monitor these individuals for the presence of radioactive contamination and radiation exposure, and manage accordingly. Recommended stay times should be enforced when working in contaminated areas.
   c. Ensure proper technique is practiced when assisting or caring for all contaminated persons and contaminated decedents. Particular caution is needed in caring for those with embedded shrapnel.

8. Carry out medical evaluation and, as necessary, treatment and follow-up of affected persons in accordance with current guidelines. All seriously injured patients (and patients with other life-threatening medical conditions) should be medically stabilized before radiation exposure/contamination and decontamination are considered.

9. Conduct population monitoring, including, as necessary, the establishment and operation of CRCs. CRCs can conduct assessment for radiation exposure and external/internal contamination, provide decontamination if needed, and refer, as necessary, for further medical evaluation/care and follow-up.

10. Provide guidance on drinking water and food.

11. Provide adequate behavioral health and mental health services.

12. Establish and manage a registry that can be used to contact affected persons who require short-term medical follow-up and/or long-term health monitoring.

13. Provide guidance on management of pets and livestock.

14. Take proper measures regarding agricultural products in the affected areas.

15. Relocate, as necessary, persons from contaminated areas.

16. Conduct clean-up/remediation of contaminated areas.
Section 2

Messages for the Public
Following a Dirty Bomb Explosion

Section 2 provides examples of messages to the public that could be utilized following detection of a dirty bomb incident (note that these messages may need to be modified to fit the specific situation). Should a dirty bomb explosion occur, it is imperative that information and guidance be quickly provided to the public so they can take appropriate actions to protect themselves from radioactive contamination and radiation exposure. Local emergency response officials should have draft messages already developed which can, should a dirty bomb incident occur, be quickly updated as necessary based on the situation, and then immediately disseminated to the public.

In most situations, the primary recommendation will be:

- GET INSIDE
- STAY INSIDE
- STAY TUNED
Dirty Bomb Explosion: Key Messages for the Impacted Community
Immediate Action Message

Suggested for local or state spokesperson: Fire Chief, Police Chief, Mayor, Governor

- An explosion has occurred at [Location] in [City]. Authorities believe [or have confirmed] that the explosion was caused by an improvised device that was a combination of conventional explosives and radioactive material.
- The explosion has dispersed radioactive material along with dust that may contain radioactive material into the air. The wind can carry this material for a distance of several blocks to a few miles.
- You need to quickly take action to prevent breathing in or ingesting this material. You also need to prevent it from getting on your skin, hair or clothing.
- If you are in the [Defined Location] area, cover your mouth and nose with a protective layer—like a cloth or a towel—to reduce the amount of potentially harmful material you breathe.
- It is very important that you do not try to evacuate out of the area unless told to do so by emergency officials. Instead, in order to protect yourself, immediately take the following steps:
  1. **Get inside:**
     - If you are anywhere in the [Location] area, get inside a building as quickly as possible.
     - Close all windows and doors and go to a basement or to the center of the building, away from windows and outer walls.
     - If you are in a car, find a building immediately and get inside.
  2. **Stay inside:**
     - Inside a building or in an underground area is the best place for you and your loved ones after a dirty bomb explosion.
     - Plan to stay inside for at least several hours or until you are instructed to leave by authorities or emergency responders.
     - Do not leave your building to get children and adults. Children and adults in schools, hospitals, nursing homes and daycare facilities will be cared for at the facility and will not be released to go outside. Going outside to get your loved ones can expose you and them to radioactive material.
  3. **Stay tuned:**
     - The Emergency Alert System will broadcast important safety messages over cell phone, radio, television, and the Internet.
     - Instructions will be updated as more information is available.
  4. **Stay calm and help those around you:**
     - It’s common for shocking experiences to trigger strong, often upsetting, reactions.
     - Do your best to remain as calm as you can and take care of yourself
       - Take a few moments to steady yourself so you can better help your loved ones; breathe deeply, close your eyes, and try to relax your body.
       - Seek accurate information about what is happening.
     - Provide emotional support to those around you, particularly children.
       - Children react to signs of stress in parents and caregivers; try to speak in an even manner and tone.
       - If possible, give children practical tasks or activities.
       - Understand that children at different developmental levels (e.g. toddlers, school-age children, teenagers) will have different needs and reactions.
     - Individuals and families in and around the affected region often experience distress and anxiety about safety, health, and recovery. These reactions are common and usually decrease over time.
- These steps to protect you and your family are the same for your pets and animals.
- Again, **get inside, stay inside, and stay tuned** for more information. Following these steps is very important to reduce your risks of contact with radioactive material.

Modified from *Improvised Nuclear Device Response and Recovery: Communicating in the Immediate Aftermath* (FEMA, June 2013)
DIRTY BOMB OR RADIOLOGICAL DISPERSAL DEVICE

What is a dirty bomb?
A dirty bomb is a mix of explosives, such as dynamite, and radioactive powder or pellets. It is also known as a radiological dispersal device (RDD).

A dirty bomb cannot create an atomic blast.

When the bomb explodes, the blast carries radioactive material into the surrounding area.

What are the dangers from a dirty bomb?
The main danger from a dirty bomb comes from the explosion, not the radiation. The explosion can cause serious injuries and property damage. People nearby could be injured by pieces of radioactive material from the bomb. Only people who are very close to the blast site would be exposed to enough radiation to cause immediate serious illness. However, the radioactive dust and smoke can spread farther away and could be dangerous to health if people breathe in the dust, eat contaminated food, or drink contaminated water. People injured by radioactive pieces or contaminated with radioactive dust will need medical attention.

What should I do to protect myself?

GET INSIDE
STAY INSIDE
STAY TUNED

http://emergency.cdc.gov/radiation

https://emergency.cdc.gov/radiation/pdf/infographic_radiological_dispersal_device.pdf
WHERE TO GO IN A RADIATION EMERGENCY

If a radiation emergency happens in your area, you should get inside immediately. No matter where you are, the safest action to take is to: GET INSIDE. STAY INSIDE. STAY TUNED.

- Close and lock all windows and doors.
- Go to the basement or the middle of the building. Radioactive material settles on the outside of buildings; so the best thing to do is stay as far away from the walls and roof of the building as you can.
- If possible, turn off fans, air conditioners, and forced-air heating units that bring air in from the outside. Close fireplace dampers.
- Bring pets inside.
- Stay tuned for updated instructions from emergency response officials.

Adapted from Ventura County Public Health, Ventura County, CA

https://emergency.cdc.gov/radiation/pdf/infographic_where_to_go.pdf
Dirty Bomb Explosion: Key Messages for the Impacted Community
Additional Safety Measures (Self-Decontamination, Food and Water Safety)

Suggested for local or state spokesperson: Fire Chief, Police Chief, Mayor, Governor

- An explosion has occurred at [Location] in [City]. Authorities believe [or have confirmed] that the explosion was caused by an improvised device that was a combination of conventional explosives and radioactive material.

- The explosion has dispersed radioactive material along with dust that may contain radioactive material into the air. The wind can carry this material for a distance of several blocks to a few miles.

- You need to quickly take action to prevent breathing in or ingesting this material. You also need to prevent it from getting on your skin, hair or clothing.

- If you are in the [Defined Location] area, cover your mouth and nose with a protective layer—like a cloth or a towel—to reduce the amount of potentially harmful material you breathe.

- It is very important that you do **not** try to evacuate out of the area **unless** told to do so by emergency officials. Trying to immediately evacuate can put you at increased risk of radiation exposure and contact with radioactive material that was spread by the explosion. Instead, in order to protect yourself, **immediately** take the following steps:

  Get inside, stay inside, and stay tuned for more information.

- Immediately getting inside a building will provide you with protection because radioactive material settles on the outside of buildings. It is important to stay as far away from the outside as possible and go to the basement or the center of the building.

- **Self-Decontamination**
  - Radioactive material can settle on your clothing, your body, and other exposed objects.
  - If dust (which may contain radioactive material) falls on you or your devices, quickly take the following steps to reduce your radiation exposure and to keep any radioactive material which may be present from spreading:
    1. **Remove your outer layer of clothing.**
       - Removing your outer layer of clothing can remove up to 90% of radioactive material. Be careful not to breathe dust that might shake loose when removing your clothes.
       - Seal the clothing you were wearing in a plastic bag or other container and place the container away from people and pets.

    2. **Wash yourself off.**
       - Take a warm shower with lots of soap. Do not burn or scratch your skin.
       - Wash your hair with shampoo or soap and water. Do not use conditioner because it will cause radioactive material to stick to your hair.
       - If you cannot shower, use a wipe or clean wet cloth to wipe skin that was not covered by clothing, like your hands and face.
       - Gently blow your nose and wipe your eyes and ears with a clean wet cloth.

    3. **Put on clean clothing.**
       - Clothing stored in a closet or inside a closed drawer is clean.
       - If you do not have clean clothes, shake or brush off your outer layer of clothing and redress. Be careful not to breathe in any dust-like particles.

- **Food Safety**
  - Food in sealed containers and any unspoiled food in your refrigerator or freezer are safe to eat. Medicine in sealed containers is safe.
  - Use a damp towel or cloth to clean all cans, bottles, packaged foods, counters, plates, pots, and utensils before using them.
  - Seal these towels or cleaning cloths in a plastic bag or other container and place them away from people and pets.
- **Water Safety**
  - Bottled water and sealed juice or soda containers will be free of radioactive contamination. Wipe or rinse the outside of bottles or cans before opening them.
  - You can drink tap water if no other drinks are available.

Modified from *Improvised Nuclear Device Response and Recovery: Communicating in the Immediate Aftermath* (FEMA, June 2013)
DECONTAMINATION FOR YOURSELF AND OTHERS

1. TAKE OFF OUTER LAYER OF CLOTHING
   - Putting the clothing in a plastic bag or other sealable container.
   - Be very careful in removing your clothing to prevent radioactive dust from shaking loose.
   - Put the bag in an out-of-the-way place, away from other people and pets.

2. WASH YOURSELF OFF
   - If you can take a shower:
     - Use soap and shampoo. Do not use conditioner because it will cause radioactive material to stick to your hair.
     - Do not scald, scrub, or scratch your skin.
     - Keep cuts and scrapes covered when washing to keep from getting radioactive material in open wounds.
   - If you cannot take a shower:
     - Wash your hands, face, and parts of your body that were uncovered at a sink or faucet. Use soap and plenty of water.
   - If you cannot use a sink or faucet:
     - Use a moist wipe, clean wet cloth, or damp paper towel to wipe the parts of your body that were uncovered. Pay special attention to your hands and face.
     - Blow your nose and wipe your eyelids, eyelashes, and ears with a moist wipe, clean wet cloth, or damp paper towel.

3. PUT ON CLEAN CLOTHES
   - If you have clean clothes:
     - Clothes stored in a closet or drawer away from radioactive material are safe to wear.
   - If you do not have clean clothes:
     - Take off your outer layer of clothing, shake or brush off your clothes, and put your clothes back on.
     - Rewash your hands, face, and exposed skin at a sink or faucet.

4. HELP OTHERS AND PETS
   - Wear waterproof gloves and a dust mask if you can.
   - Keep cuts and scrapes covered when washing to keep radioactive material out of the wound.
   - Rewash your hands, face, and parts of your body that were uncovered at a sink or faucet.

STAY TUNED FOR UPDATED INFORMATION FROM PUBLIC HEALTH OFFICIALS.

Section 3

Dirty Bomb (DB) Explosion:
Missouri Department of Health and
Senior Services (DHSS) Tasks and Issues

Section 3 contains tables which relate to the Missouri Department of Health and Senior Services (DHSS) and its preparation for, and expected response to, a dirty bomb incident.

The first two tables describe steps that DHSS can take to prepare to respond to a dirty bomb incident.

**Dirty Bomb Explosion: DHSS Tasks – No Known Threat**

**Dirty Bomb Explosion: DHSS Tasks – Pre-Response Phase**

The last three tables summarize the expected response to a dirty bomb incident, and list some of the potential issues that would need to be addressed by DHSS programs and staff.

**Dirty Bomb Explosion: DHSS Tasks – Response Phases 1 and 2: Early and Intermediate Phases**

**Dirty Bomb Explosion: DHSS Tasks – Response Phase 3: Late Phase**

**Acronyms**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARS</td>
<td>Acute Radiation Syndrome</td>
</tr>
<tr>
<td>CDC</td>
<td>Centers for Disease Control and Prevention</td>
</tr>
<tr>
<td>COOP</td>
<td>Continuity of Operations</td>
</tr>
<tr>
<td>CRC</td>
<td>Community Reception Center</td>
</tr>
<tr>
<td>DB</td>
<td>Dirty Bomb</td>
</tr>
<tr>
<td>DCC</td>
<td>Day Care Center</td>
</tr>
<tr>
<td>DCPH</td>
<td>Division of Community and Public Health</td>
</tr>
<tr>
<td>DHSS</td>
<td>Missouri Department of Health and Senior Services</td>
</tr>
<tr>
<td>DMA/EMAC</td>
<td>Disaster Mortuary Affairs/Emergency Management Assistance Compact</td>
</tr>
<tr>
<td>DRL</td>
<td>Division of Regulation and Licensure</td>
</tr>
<tr>
<td>ED</td>
<td>Emergency Department</td>
</tr>
<tr>
<td>EMS</td>
<td>Emergency Medical Services</td>
</tr>
<tr>
<td>EMT</td>
<td>Emergency Medical Technician</td>
</tr>
<tr>
<td>ERC</td>
<td>Emergency Response Center</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information Systems</td>
</tr>
<tr>
<td>IC</td>
<td>Incident Command</td>
</tr>
<tr>
<td>ICU</td>
<td>Intensive Care Unit</td>
</tr>
<tr>
<td>Invest/Surveillance</td>
<td>Investigations/Surveillance Section</td>
</tr>
<tr>
<td>JIC</td>
<td>Joint Information Center</td>
</tr>
<tr>
<td>LPHA</td>
<td>Local Public Health Agency</td>
</tr>
<tr>
<td>LPHA Mgmt</td>
<td>Local Public Health Agency Management</td>
</tr>
<tr>
<td>M-ICT</td>
<td>Medical Incident Coordination Team</td>
</tr>
<tr>
<td>OEC</td>
<td>Office of Emergency Coordination</td>
</tr>
<tr>
<td>OPI</td>
<td>Office of Public Information</td>
</tr>
<tr>
<td>Planning</td>
<td>Planning Section</td>
</tr>
<tr>
<td>Public Info</td>
<td>Public Information</td>
</tr>
<tr>
<td>REAC/TS</td>
<td>Radiation Emergency Assistance Center/Training Site</td>
</tr>
<tr>
<td>Senior/Disability</td>
<td>Senior and Disability Services</td>
</tr>
<tr>
<td>SEOC</td>
<td>State Emergency Operations Center</td>
</tr>
<tr>
<td>SNS</td>
<td>Strategic National Stockpile</td>
</tr>
</tbody>
</table>
## Dirty Bomb (DB) Explosion: DHSS Tasks

### No Known Threat

In the absence of credible intelligence of a planned DB attack, maintain readiness should such an incident (or other major emergency incidents) occur without warning.

<table>
<thead>
<tr>
<th>DHSS SEOC Team</th>
<th>OEC/ERC Team</th>
<th>Rad Program</th>
<th>Other DHSS Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain an understanding of the role of each ERC team member in responding to emergency incidents.</td>
<td>Maintain a general understanding of natural disasters, terrorism incidents, and industrial/transportation accidents that could significantly impact Missouri.</td>
<td>Acquire and maintain equipment necessary for response to all potential incidents involving radiation.</td>
<td>Strongly encourage all DHSS staff to have personal emergency plans and to communicate these plans to their families.</td>
</tr>
<tr>
<td>Ensure all team members have developed personal emergency plans and communicated these plans to their families.</td>
<td>Maintain an understanding of the basic response (and especially the DHSS response) to events that have one or more of the following as a component:*</td>
<td>Maintain an understanding of the consequences of the different potential types of radiation incidents, and the components of the response to each incident type.</td>
<td>Ensure an appropriate DHSS COOP Plan has been developed, and exercised, and is ready to be implemented if needed.</td>
</tr>
<tr>
<td>Maintain a general understanding of natural disasters, terrorism incidents, and industrial/transportation accidents that could significantly impact Missouri.</td>
<td>1. traumatic injuries/burns,</td>
<td>All Rad Team members should periodically undergo appropriate training and exercises.</td>
<td>For DHSS staff who are not on the ERC or SEOC teams but who would be involved in the response to emergency incidents:</td>
</tr>
<tr>
<td>Maintain an understanding of the basic response (and especially the DHSS response) to events that have one or more of the following as a component:*</td>
<td>2. infectious biological agents,</td>
<td>Maintain an understanding of the role of each ERC team member in responding to emergency incidents.</td>
<td>Maintain a general understanding of natural disasters, terrorism events, and industrial/transportation accidents that could significantly impact Missouri.</td>
</tr>
<tr>
<td>Maintain a general understanding of the role of each ERC team member in responding to emergency incidents.</td>
<td>3. toxic/poisonous chemical agents,</td>
<td>Engage in ongoing planning and exercises to optimize the OEC/ERC response to an emergency incident.</td>
<td>Maintain an understanding of the basic response (and especially the DHSS response) to events that have one or more of the following as a component:*</td>
</tr>
<tr>
<td>Participate in exercises to optimize the response to an emergency incident.</td>
<td>4. radiation/radioactive materials,</td>
<td>(ERC command staff and section chiefs should be involved in the planning process.)</td>
<td>1. traumatic injuries/burns,</td>
</tr>
<tr>
<td>Ensure ERC/SEOC Go-Kits are ready, and that all equipment in the ERC (e.g., radios, computers, back-up flash drives, etc.) is functioning properly.</td>
<td>5. loss of infrastructure (e.g., transportation, health care and public health, communications, electrical power, water, etc.),</td>
<td>Ensure that EMS providers have a basic plan/protocols for response, including dispatch and pre-hospital protocols (including triage protocols) for responding to a mass-casualty incident.</td>
<td>2. infectious biological agents,</td>
</tr>
<tr>
<td>Monitor news, emergency notifications, and other sources for the occurrence, or threat of occurrence, of a major emergency incident having public health implications.</td>
<td>6. mass fatalities</td>
<td>Ensure the ready availability of necessary equipment.</td>
<td>3. toxic/poisonous chemical agents,</td>
</tr>
<tr>
<td>Maintain general awareness of the anticipated DHSS response to potential natural disasters, terrorism incidents, and industrial/transportation accidents.</td>
<td></td>
<td>Conduct specialized training for EMT-Basics and EMT-Paramedics.</td>
<td>4. radiation/radioactive materials,</td>
</tr>
<tr>
<td>Work with other DHSS program areas to ensure the Poison Center hot line contract can be immediately activated if necessary.</td>
<td></td>
<td>Identify hospitals capable of receiving patients with these different types of injuries, along with their capacities.</td>
<td>5. loss of infrastructure (e.g., transportation, health care and public health, communications, electrical power, water, etc.),</td>
</tr>
<tr>
<td>Assist appropriate program staff in developing and updating, as necessary, draft Health Alerts for selected potential emergency incidents. From these drafts, a finalized version can be quickly put together and sent out if a specific incident were to occur.</td>
<td></td>
<td></td>
<td>6. mass fatalities</td>
</tr>
</tbody>
</table>

### No Known Threat

Ends when a dirty bomb explosion occurs at a location in the U.S., or when there is credible intelligence of a plan to explode a DB in a populated area in the U.S. (Go to Pre-Response Phase.) OR

Ends when a DB explosion occurs without warning in Missouri, or potentially when a DB explosion occurs in a location immediately adjacent to Missouri in an adjoining state. (Go to Response Phases 1 and 2.)
*All major emergency incidents (e.g., natural disasters, terrorism incidents, industrial/transportation accidents) would have one or more of the following components: 1) traumatic injuries/burns, 2) infectious biological agents, 3) toxic/poisonous chemical agents, 4) radiation/radioactive materials, 5) loss of infrastructure (e.g., transportation, health care and public health, communications, electrical power, water, etc.), 6) mass fatalities. Most incidents would likely involve combinations of these elements.
# Dirty Bomb (DB) Explosion: DHSS Tasks

## Pre-Response Phase

**Pre-Response Phase**

(creditable Intelligence)

**Beginning when there is credible intelligence of a plan to explode a DB in a populated area in the U.S.**

Preparations are initiated for the DHSS response to a DB incident. The primary strategy is to closely monitor events and take necessary steps to ensure that DHSS is prepared to immediately begin an effective response if a DB explosion occurs.

(Regarding the tasks listed in the columns to the right, it is assumed that at least some information on the potential threat can be shared with DHSS staff.)

## DHSS SEOC Team

- Continue tasks listed for the period of No Known Threat.
- Ensure availability of necessary SEOC Team members.
- Ensure all team members are aware of the threat and the potential for activation.
- Ensure all team members have developed personal emergency plans and communicated these plans to their families.
- Ensure, as necessary, that all team members receive periodic briefings on the current situation.
- Ensure all team members are knowledgeable about the effects of a DB explosion, and the basic components of the response to such an event (especially DHSS’ response). Information can be provided on the DHSS Intranet and the DHSS website, and through other mechanisms.
- Conduct further training, as necessary, on DB’s and the response to a DB incident.
- Conduct DB exercises, as necessary.

## OEC/ERC Team

- Continue tasks listed for the period of No Known Threat.
- Ensure availability of necessary OEC staff and ERC Team members.
- Ensure all team members are aware of the threat and the potential for activation.
- Ensure all team members have developed personal emergency plans and communicated these plans to their families.
- Ensure, as necessary, that all team members receive periodic briefings on the current situation.
- Ensure all team members are knowledgeable about the effects of a DB explosion, and the basic components of the response to such an event (especially DHSS’ response). Information can be provided on the DHSS Intranet and the DHSS website, and through other mechanisms.
- Conduct further training, as necessary, on DB’s and the response to a DB incident.
- Conduct DB exercises, as necessary.

## Rad Program

- Continue tasks listed for the period of No Known Threat.
- Ensure availability of necessary personnel.
- Ensure equipment and vehicles necessary for response to a DB incident are available and working properly.
- Provide, as necessary, additional education and training to Rad Team members on the impact of, and response to, a DB incident.
- Conduct, as necessary, information and training sessions with ERC/SEOC team members, DHSS and DCPH leadership, and other DHSS staff who could potentially be involved in the response to a DB incident.
- Receive periodic briefings on the current situation.
- Review, in conjunction with OEC staff, the need to update and re-issue the Health Guidance document currently entitled “Management in a Hospital Setting of Persons Contaminated With Radioactive Material and Exposed to Radiation Following a Dirty Bomb Explosion – 2013.”

## Other DHSS Programs

- Continue tasks listed for the period of No Known Threat.
- Ensure, as necessary, that appropriate staff are aware of the threat and receive information on the current situation.

**DHSS and DCPH Leadership:**

- Ensure that staff in leadership positions are aware of the effects of a DB explosion, and the basic components of the response to such an event (especially DHSS’ response).

**DCPH Leadership:**

- Provide guidance to the ERC and the Radiation Program on the possible development of a Health Advisory for medical providers, facilities, and LPHAs.
- Provide guidance to the ERC on the possibility of providing to appropriate DHSS staff general information and guidance on a DB explosion, and the basic components of the DHSS response to such an event.

**OPI:**

- Receive periodic briefings on the current situation.
- Review/modify any available draft messages on DBs for the public, along with existing fact sheets and other materials on this subject, to ensure these materials are ready for use should a DB incident occur.
- Develop, as necessary, additional draft messages and fact sheets for the public on dirty bombs and the response to a dirty bomb explosion.
- Consider, if appropriate, and in conjunction with other state agencies, issuing (before an incident occurs) media releases that describe the effects of a DB and the basic elements of the response, along with general protective actions that the public can take in this type of accident.
- Be alert to the possibility of inaccurate messages regarding dirty bomb incidents being sent in the media/social media. If necessary, take steps to counter

Ends when a DB explosion occurs in Missouri, or potentially when a DB explosion occurs in a location immediately adjacent to Missouri in an adjoining state. (Go to Response Phase 1.)

or

Ends when there is no longer credible intelligence of a plan to explode a DB in a populated area in the U.S. (Go back to No Known Threat.)

### DHSS Tasks and Issues
- **M·ICT**
  - Team moves to "On Alert" or "Advisory" status, dependent on the assessment of current risk for the potential incident.
  - Team status is reflected in EMResource.
  - May conduct briefing via conference call for situational awareness.
  - Discuss any medical or healthcare needs in order to be prepared for response.

- **EMS**
  - Alert ambulance services to prepare for the possibility of a dirty bomb incident.
  - Ensure availability of any known relevant information regarding the potential incident.
  - Ensure that EMS providers have adequate dispatch and pre-hospital protocols (including triage protocols) for responding to a dirty bomb explosion.
  - Identify preliminary logistical needs for responding to this type of incident (equipment, decontamination needs, etc.)
Dirty Bomb (DB) Explosion: DHSS Tasks

**Phase 1: Early Phase**
(Lasts hours to days.)

Begins when a DB explosion occurs in Missouri or in a location in an adjoining state that is immediately adjacent to Missouri.

Local emergency responders and government officials will, following rapid evaluation of conditions in the area of the incident, implement protective actions (such as evacuation and sheltering in place). Actions will also be implemented to protect responders, and injured persons (who may be contaminated) will be transported to appropriate medical care. Control of access to the area potentially contaminated with radioactive material will be instituted. Decontamination of persons contaminated with radioactive material can occur in a variety of settings, including designated decontamination sites, or at home. Environmental radiation monitoring will commence, as measurements start to become available, they will be used to better determine necessary protective actions, and to better determine the boundaries of radiation control zones. Emergency response and government officials will communicate with the public through local TV-radio stations, social media, and the Internet, providing continually updated information and guidance. Information and guidance will also be provided through appropriate mechanisms to emergency responders, medical providers and facilities, and to government decision-makers.

SEOC and the ERC will activate. DHSS will provide appropriate assistance, which may include deploying the department’s Rad Team to help with environmental monitoring and other tasks at the incident site. DHSS will also be issuing a Health Alert, and likely subsequent Health Updates, to medical providers, medical facilities, and LPHAs statewide. Planning will begin for population monitoring, and for the potential use of medical countermeasures for persons with significant internal contamination. If necessary, medications and medical supplies will be requested from the SNS. Other issues that may need to be addressed include: the potential need for shelters for evacuated persons (who may be contaminated), and providing assistance to individuals with special needs who must be evacuated from, or shelter in place within, contaminated areas. In addition, an embargo on agricultural products and activities in the affected area may be put in place temporarily.

Phase 1 ends when the injured have been removed, the scene is controlled, and an initial estimate of the location (and radiation levels) of deposited radioactive material have been obtained through initial environmental monitoring. (Go to Phase 2. Note there will likely not be a clearly defined point at which Phase 1 ends and Phase 2 begins.)

**Phase 2: Intermediate Phase**
(Lasts days to weeks; may overlap with Phase 1, and later with Phase 3.)

Begins once the injured have been removed, the scene is controlled, and an initial estimate of the location (and radiation levels) of deposited radioactive material have been obtained through initial environmental monitoring.

The response will continue with increasing state and Federal assistance. SEOC and the ERC will remain activated. Environmental monitoring will provide increasing information on the location (and radiation levels) of deposited radioactive material. This information will be used to update guidance on protective actions for responders and the public. Once radiation levels and risk of contamination are found to be acceptable, sheltering in place will end and many evacuated people may be allowed to return. However, some evacuated persons may remain in shelters for a period of time (and perhaps an extended period of time if radiation levels remain high enough). Emergency response/government officials will continue to communicate updated information and guidance to the public, emergency responders, medical providers and facilities, and government decision-makers. DHSS may issue Health Updates for medical providers and facilities, and LPHAs. If not already done so, DHSS’ Rad Team may deploy to the site of the incident to assist with environmental monitoring and other activities. If medications and medical supplies are to be obtained from the SNS, they will be received and distributed to medical facilities and possibly other locations. Population monitoring will take place, probably at CRCs which will be managed by local public health officials. Persons estimated to have significant internal contamination will receive medical countermeasures if appropriate. These medical counter-measures will likely be obtained from the SNS. Continued assistance will need to be provided to individuals with special needs who live in the affected area. Plans will be made for long-term medical follow-up of persons who experienced potentially significant radiation exposure. Plans will also be made for clean-up/remediation of the area contaminated with radioactive material, including a determination of acceptable residual radiation levels. Decisions will be made and undertaken regarding relocation of persons living in areas with unacceptably high radiation levels. This might involve moving these individuals to temporary housing.

Phase 2 ends when clean-up and remediation of affected areas begin. Note there will likely not be a clearly defined point at which Phase 2 ends and Phase 3 begins.)
- boundaries of the plume
- IC Post
- evacuation area(s)
- shelter in place area(s)
- decontamination site(s)
- hospitals/other medical facilities
- schools, DCCs
- nursing homes/long-term care facilities
- jails/prisons
- water/sewage treatment plants
- airports
- other important locations

**Mental Health - Potential Issues**

- Adverse psychological reactions in members of the public, and in responders and health care workers, related to factors such as:
  - the explosion and its effects
  - fear of radiation
  - lack of understanding/trust in information and guidance provided by public officials
  - fear of additional incidents
- Mental health professionals may lack knowledge of radiation and its effects, and may themselves have unwarranted fears of radiation.

**EMS - Potential Issues**

- Need to activate mutual aid plans and specific response logistics.
- Need to activate decontamination stations.
- Capacity to transport injured (and very possibly contaminated) persons.
- Proper measures to protect personnel from radioactive contamination and radiation exposure, and equipment from radioactive contamination. Need to decontaminate or resolve contamination issues involving personnel and equipment.
- Interfacility transports of patients (those needing higher-level or specialized care)
- EMS personnel may lack knowledge of radiation and its effects, and may themselves have unwarranted fear of radiation.

**DNA/EMAC - Potential Issues**

- Significant number of fatalities from the explosion (likely contaminated).
- Proper measures to protect mortuary personnel from radioactive contamination and radiation exposure, and equipment from radioactive contamination.
- Mortuary personnel may lack knowledge of radiation and its effects, and may themselves have unwarranted fear of radiation.

<table>
<thead>
<tr>
<th>Potential Issues</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness of the current status of the incident,* including current guidance issued by local, state, and Federal officials.</td>
<td>Information needs of the ERC stations.</td>
</tr>
<tr>
<td>Invest/Survey - Potential Issues</td>
<td>LPHA Mgmt - Potential Issues</td>
</tr>
<tr>
<td>- Injured persons.</td>
<td>- Status of LPHA(s) in affected area.</td>
</tr>
<tr>
<td>- Persons with radiation-related illness.</td>
<td>- Adequacy of LPHAs’ situational awareness of the incident, including their knowledge of current recommendations for medical providers/facilities, and for the public.</td>
</tr>
<tr>
<td>- Persons with mental health issues related to the incident.</td>
<td>- Adequacy of LPHAs’ knowledge of radiation, DBs, and the response to a DB incident; information on these issues may need to be provided to LPHA staff.</td>
</tr>
<tr>
<td>- Necessary surveillance activities, including surveillance in shelters if these are set up.</td>
<td>DRL - Potential Issues</td>
</tr>
<tr>
<td>- Needs of health care facilities seeing patients with injuries, radioactive contamination, and/or radiation exposure.</td>
<td>- Current status of each hospital in the affected area, and in surrounding areas.</td>
</tr>
<tr>
<td>- Concerns on the part of health care facilities about radioactive contamination/radiation exposure.</td>
<td>- Needs of health care facilities seeing patients with injuries, radioactive contamination, and/or radiation exposure.</td>
</tr>
<tr>
<td>Senior/Disabi - Potential Issues</td>
<td>- Concerns on the part of health care facilities about radioactive contamination/radiation exposure.</td>
</tr>
<tr>
<td>- Persons with disabilities who are told to evacuate, including the need to provide assistance in evacuation.</td>
<td>- Status of persons with disabilities who are sheltering in place.</td>
</tr>
<tr>
<td>- Ability of persons providing care to enter affected areas and provide necessary services.</td>
<td>M-ICT</td>
</tr>
<tr>
<td>- Content and accuracy of information and guidance being put out through radio, TV, print media, Internet, and social media.</td>
<td>Team moves to “Active” status, and this</td>
</tr>
<tr>
<td>- Presence of inaccurate or misleading information and rumors.</td>
<td>Team status is reflected in EMResource.</td>
</tr>
<tr>
<td>- Helping OPI and the JIC provide the public with accurate, understandable, and up-to-date information and guidance pertaining to radiation, DBs, radioactive contamination, and radiation exposure. Specific information may also be needed to counteract inaccurate or misleading information and rumors.</td>
<td>Consider query of status of hospital-based decon centers.</td>
</tr>
<tr>
<td>- Provide technical consultation for population monitoring if necessary.</td>
<td>Forward pertinent and current information to medical providers and hospitals as per DHSS directive.</td>
</tr>
<tr>
<td></td>
<td>Assist with queries to medical providers and healthcare facilities to assure readiness to respond.</td>
</tr>
<tr>
<td></td>
<td>Discuss any resources requests from medical providers and healthcare facilities to determine if assistance is required.</td>
</tr>
</tbody>
</table>

*necessary information, guidance, and other technical assistance to responders and local officials in the affected area. |

- If the Rad Team is deployed to the location of the incident:
  - Ensure safety of Rad Team members. |
  - Assist with environmental monitoring and other activities as necessary. |
  - Provide technical consultation for population monitoring if necessary. |

- Provide guidance to the ERC and appropriate program areas on the development of a Health Alert and, as needed, subsequent Health Updates.
- Determine if a hot line(s) – at DHSS and/or the Poison Center – needs to be established to take calls from the public and from medical providers and facilities. If so, ensure appropriate steps are taken to activate the hot line(s).

**OPI**

- Maintain continual awareness of the current status of the incident, and of current guidance issued to medical providers and the public.

  - Assist the JIC and/or other appropriate entities with the rapid development and dissemination to the public of information and guidance (updated as necessary) regarding the incident. Potentially included here would be information to counteract inaccurate or misleading information and rumors which are being disseminated. |
  - Provide answers to inquiries from the media and the public, or direct these inquiries to the proper entity (e.g., the JIC). |

**DHSS Leadership**

- Provide guidance to the ERC and appropriate program areas on the development of a Health Alert and, as needed, subsequent Health Updates.
- Determine if a hot line(s) – at DHSS and/or the Poison Center – needs to be established to take calls from the public and from medical providers and facilities. If so, ensure appropriate steps are taken to activate the hot line(s).
Dirty Bomb (DB) Explosion: DHSS Tasks

### Response Phase 3

**Phase 3: Late Phase**
(Lasts months to years.)

**Begins when clean-up and remediation of affected areas begin.**

Actions taken during this phase are designed to reduce radiation levels in the environment to acceptable levels. In addition, ongoing sampling of agricultural products from the affected (and nearby) areas will be undertaken, looking for evidence of radiation concentrations that exceed those at which continued interventions would be necessary. Long-term medical follow-up of persons who experienced radiation exposure during the incident will commence.

**Phase 3 ends when clean-up and remediation is completed. (Medical follow-up of exposed persons may continue for decades.)**

<table>
<thead>
<tr>
<th>DHSS SEOC Team</th>
<th>OEC/ERC</th>
<th>Rad Program</th>
<th>Other DHSS Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>• SEOC may only remain activated during the early part of this phase.</td>
<td>• The ERC may remain activated only during the early part of this phase of the incident.</td>
<td>• Maintain continual awareness of the current status of clean-up and remediation efforts, and of current guidance issued by government officials.</td>
<td>• DCPH Leadership:</td>
</tr>
<tr>
<td>• While SEOC is activated, maintain continual awareness of the current status of the clean-up and remediation efforts, and of current guidance issued by government officials.</td>
<td>• Maintain continual awareness of the current status of clean-up and remediation efforts, and of current guidance issued by government officials.</td>
<td>• Rad Team members may continue to assist in environmental monitoring.</td>
<td>– Maintain continual awareness of the current status of the clean-up and remediation efforts, and of current guidance issued by government officials.</td>
</tr>
<tr>
<td>• GIS mapping will continue to be needed.</td>
<td>• Also remain aware of the response of those affected by the incident to guidance issued by government officials (e.g., guidance pertaining to clean-up and remediation, safe radiation levels, relocation, re-entry, etc.).</td>
<td>• Continue to provide, in conjunction with Federal partners, consultation and guidance to local officials regarding clean-up and remediation, safe radiation levels, relocation, re-entry, etc.</td>
<td>– Provide guidance to the ERC and appropriate program areas on the development, as needed, of Health Updates.</td>
</tr>
<tr>
<td>• Mental health issues will very possibly persist, and will need to be addressed.</td>
<td>• Work with appropriate program areas and DCPH leadership to develop and send out, as needed, Health Updates. It remains important for medical providers, particularly those seeing patients affected by the incident, to have up-to-date information and clinical guidance.</td>
<td>• DCPH Leadership:</td>
<td>- Assist the JIC (if still in operation) and/or other appropriate entities in providing updates to the public as new information and guidance become available.</td>
</tr>
<tr>
<td></td>
<td>• If a hot line(s) continues to be in operation, provide necessary information/updates to the hot line so that questions can be answered in an understandable, accurate, and consistent manner.</td>
<td></td>
<td>- Provide answers to inquiries from the media, or direct these inquiries to the proper entity.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Be alert to the presence of inaccurate or misleading information and rumors, and to the response of those affected by the incident to guidance being provided by government officials. As necessary, provide information to the public on these issues.</td>
</tr>
</tbody>
</table>
Important information for monitoring the current status of a DB incident (not a comprehensive list):

- Size and location of explosion.
- Impact on infrastructure (including streets/highways). Time frame for needed repairs or other necessary actions.
- Injuries and fatalities
  - Numbers of persons injured and killed. Status of injured.
  - Number of persons transported/need transport to hospital.
  - Number of persons trapped or otherwise unable to be immediately removed from the scene.
  - Number of persons self-presenting to medical facilities with injuries and/or external contamination. Number presenting with no injuries or external contamination wanting evaluation.
  - Availability of ambulances/EMTs.
  - Status of hospitals in the area (ED, inpatient beds, ICU beds, burn unit beds, availability of medical and ancillary personnel).
- Medical and non-medical resources available/needed. Time frame for receiving needed resources. SNS Program involvement.
- Plans for use of medical countermeasures for treating persons with significant internal contamination.
- Information/guidance for medical providers/facilities and LPHAs.
  - Health Alerts and Updates (DHSS and LPHA) being developed/sent.
  - Information/guidance for medical providers/facilities and responders on DHSS/LPHA/CDC/other Federal government websites.
  - Hot lines for calls from medical providers/facilities that are in use (including data on the numbers and types of calls being received) or planned.
- Radiation in the environment.
  - Location of plume and radiation levels within the plume.
  - Important facilities within the plume (medical care, residential/long-term care, pharmacies, dialysis centers, schools/DCCs, jails/prisons, infrastructure, etc.
  - Location of areas (which will change over time) where evacuation has/will occur, and where sheltering-in-place is occurring. When will evacuated persons be able to return? When will sheltering in place end?
- Information/guidance for the public.
  - Media coverage.

- Who is providing information to the media now/in the future? Has/will a JIC be set up.
- Instructions/guidance being provided to persons in the area.
- DHSS/JIC/other state, local, or Federal media releases/briefings, and social media messages.
- Information/guidance for the public on DHSS/LPHA/CDC/other Federal government websites.
- Hot lines for calls from the public that are in use (including data on the numbers and types of calls being received) or planned.
- How are persons in the area responding to the situation? What is being said on social media? Rumors or misinformation (including source)? Concerns about additional attacks?
- How is decontamination of contaminated persons being handled? Are decontamination sites being set up (and if so, where)?
- Issues involving access and functional needs persons in the affected (and possibly nearby) areas.
- Need/plans for shelters? If set up: size, location, other characteristics, and numbers and types of persons being housed there. Also, if set up, how are issues of contamination being addressed?
- Surveillance/epidemiological activities (e.g., collecting, analyzing, and interpreting data on injuries, deaths, cases of known or suspected ARS, persons with radioactive contamination, internally contaminated persons treated with medical countermeasures, etc.).
- Mental health issues identified. Mental health response planned/in place.
- CRC(s) planned/in place (including location, anticipated/actual numbers of persons presenting, information on those presenting including number with external contamination and/or evidence of internal contamination, and number referred to medical care or other follow-up).
- Number of deceased. Management (or plans for management). Availability of necessary resources.
- Issues involving animals, including recommendations, decontamination options, and (if needed) sheltering.
- Issues involving agriculture, including recommendations, and actions being undertaken/anticipated.
- Federal assets/assistance in place or anticipated (including time frames).
- Weather (present/future).
- Demographic information on the affected area.
Part 2

Additional Information and Reference Material
Section 4

Detailed Information on NPIs
Following a Dirty Bomb Explosion

Section 4 describes in more detail the NPIs that were summarized in Section 1.
Detailed Information on NPIs Following a Dirty Bomb Explosion

The guidance provided in this document assumes the incident does not additionally involve biological or chemical agents. If such involvement was present, radiation issues might be overshadowed by more immediate health concerns related to these agents.

In planning the response to a dirty bomb explosion, the suddenness of the incident must be taken into account along with the likelihood that the incident might have substantial scale. For example, large numbers of persons could potentially be contaminated with radioactive material given that an attack would very possibly occur in an urban environment. In addition, many square miles might end up with at least some degree of environmental contamination, raising issues such as relocation of residents and remediation. The Centers for Disease Control and Prevention (CDC) has provided some general principles for responding to a radiation incident, and these are shown in Appendix D.

Also be aware that in the period immediately following an explosion, it will very likely not be known whether radioactive material was involved (i.e., whether the explosion was due to a dirty bomb), and it may not even be immediately known whether the explosion was due to a bomb or to an accident such as a natural gas explosion). Emergency responders with radiation detection equipment will determine whether the explosion dispersed radioactive material into the environment.

Responding to a dirty bomb explosion will be complex and difficult. The information provided below does not cover all aspects of the response, and planners should refer to the references linked to in the text for further guidance.

A. Interventions for Individuals

1. Follow all recommendations of emergency response/public health officials.

   • Emergency response/public health officials will be providing information and guidance to different groups including the public, medical professionals, on-scene emergency responders, and elected leaders and policy makers.

   • The information provided will be updated periodically, and the guidance will likely change as a better understanding of the situation is obtained, and as the situation itself evolves.

   • Information and guidance will be conveyed by on-scene emergency responders, local TV and radio stations, government Internet and social media sites, newspapers, and other mechanisms that may be available.

2. Be alert for, and seek to avoid, non-radiation dangers in the area of the explosion.

   • In the period immediately following an explosion, it will very likely not be known whether radioactive material was involved (or possibly even whether the explosion was due to a bomb or to an accident such as a natural gas explosion). Regardless of the cause of the explosion, there are certain protective actions that should be taken immediately after the blast. If it is subsequently found that the explosion was caused by a dirty bomb, many of these actions will, very importantly, provide protection from radiation exposure and contamination with radioactive material (see #3 below).

   • Many of the dangers that would be associated with explosions (and, in particular, those associated with explosions caused by bombs), along with specific protective actions that individuals should take, are summarized in a fact sheet from the Department of Homeland Security (DHS) and the National Academies, found at http://www.dhs.gov/xlibrary/assets/prep_ied_fact_sheet.pdf.
The protective actions described in this fact sheet (some of which are listed, in slightly modified form, below) would generally be applicable following most explosions, including those caused by a dirty bomb.

- If in a building where an explosion has occurred:
  - Get under a sturdy table or desk if objects are falling around you.
  - Cover your nose and mouth with anything you have on hand to limit inhalation of dust or other hazardous materials. Dense-weave cotton material can act as a good filter.
  - Stay away from possible bomb parts or materials.
  - Exit as quickly as possible, without stopping to retrieve personal possessions or make phone calls.
  - Assist other victims to leave the area if possible.
  - Use stairs instead of elevators.
  - Be aware of weakened floors and stairways, and watch for falling debris as you exit the building.

- Once out of the building:
  - Continue to cover your nose and mouth to limit inhalation of dust or other hazardous materials.
  - Move away from windows, glass doors, or other potentially hazardous areas.
  - Stay away from possible bomb parts or materials.
  - Be aware that secondary explosions may occur at or near the original bombing site, especially as rescue personnel arrive.
  - Use caution to avoid debris that could be hot, sharp, or cause puncture wounds.
  - Continue moving away from the immediate blast site. Look and listen for instructions from local authorities.
  - If no information is immediately available from local officials, stay away from windows and doors, and move to an inner area of an undamaged building until directed differently by authorities. Listen to local TV/radio stations.
  - Limit your use of phones and other communications devices as much as possible because communications systems may become overloaded.
  - Do not eat, drink, or smoke.

- If trapped:
  - Cover your nose and mouth with anything you have on hand to limit inhalation of dust or other hazardous materials. Dense-weave cotton material can act as a good filter.
  - Avoid unnecessary movement so you don’t kick up dust.
  - Signal your location to rescuers by using a flashlight or whistle, tapping on a pipe or wall, or using other appropriate means that may be available.
  - Shout only as a last resort. Shouting can cause you to inhale dangerous amounts of dust and drain your energy.

- If near, but not at, the immediate site of the explosion:
  - Cover your nose and mouth with anything you have on hand to limit inhalation of dust or other hazardous materials. Dense-weave cotton material can act as a good filter.
  - Assess the environment around you before taking any action. Stay away from possible bomb parts or materials.
  - Avoid being lured closer to see what is happening because the risks from secondary attacks or hazardous materials could be extremely high.
Listen for, and follow, instructions from local authorities.

- If no information is immediately available from local officials, stay away from windows and doors, and move to an inner area of an undamaged building until directed differently by authorities. Listen to local TV/radio stations.
- Limit your use of phones and other communications devices as much as possible because communications systems may become overloaded.
- Do not eat, drink, or smoke.

- Attempting to avoid exposure to dust, debris, and smoke should be among the top priorities in any situation where there has been an explosion (regardless of whether radioactive material is known to be present), but avoiding other dangers must also be considered. Unless instructed by authorities to take other actions, going inside, or remaining inside, an undamaged building is a good way to minimize exposure to dust, debris, and smoke.

3. Avoid, or minimize, contact with radioactive material

- Following a dirty bomb explosion, it is very important to avoid, or minimize, contact with radioactive material. This material can include radioactive dust, smoke, debris, and bomb parts.

- Avoiding contact means:
  - Not getting radioactive material on skin and clothing, and not inhaling or ingesting radioactive material, or getting this material into the body through broken areas of skin.
  - Keeping a reasonable distance from any bomb parts or materials. Such parts or materials could potentially be radioactive and a source of external radiation exposure.

- Emergency responders with radiation detection equipment will determine whether the explosion dispersed radioactive material into the environment (indicating the explosion was caused by a dirty bomb). If this is found to be the case, the following actions should be taken:
  - The recommendations listed in #2 above, which should have already been taken, remain generally applicable now that the presence of radiation/radioactive material has been discovered. As previously mentioned, many of these actions will help protect individuals from radiation exposure and contamination with radioactive material.
  - Do not go into the area of the explosion unless one is a responder utilizing appropriate personal protective equipment (PPE) and with appropriate radiological monitoring/dosimetry in place.
  - If this has not already been done, go inside, or remain inside, an undamaged building to minimize exposure to potentially radioactive dust, debris, and smoke (unless instructed by authorities to take other actions).

  - CDC’s message here is to “GET INSIDE, STAY INSIDE, and STAY TUNED” [for updated instructions from local authorities] – For additional information, see https://emergency.cdc.gov/radiation/pdf/infographic_where_to_go.pdf.
  - Avoid touching any possibly contaminated surfaces. Keep hands away from the face (especially the mouth) until one has undergone decontamination, and there is no radioactive contamination in the immediate environment.
Although mentioned in #2 above, it is important to emphasize not eating or drinking if there is a risk of ingesting radioactive material, and not smoking if there is a risk of inhaling radioactive material dispersed by the explosion. (It could be added that smoking, under any circumstances, always involves the inhalation of radioactive material [such as polonium-210].)

If skin or clothing is, or might be, contaminated with radioactive material, as soon as possible undergo decontamination. (See #4 below.)

Avoid (unless one is an emergency responder/medical provider with appropriate PPE) direct physical contact with persons whose skin, hair, or clothing may be contaminated with radioactive material until they have been adequately decontaminated (see below). Once adequately decontaminated and dressed in non-contaminated clothing, these individuals do not present a risk to others.

If told by emergency response/public health officials to evacuate the area, follow their instructions. Additional information on evacuation during a radiation incident is provided at https://emergency.cdc.gov/radiation/evacuation.asp and https://emergency.cdc.gov/radiation/pdf/radiation-evacuation.pdf.

Emergency responders and medical personnel should always use appropriate PPE and personal dosimetry. Radiation exposure should be closely monitored. Incident managers should ensure that appropriate radiation exposure guidelines are followed.

Exercise caution in caring for persons who were close to the explosion and who received shrapnel wounds. Embedded shrapnel, if it is radioactive, could potentially cause radiation exposure to those nearby. (Note that an individual would not be considered adequately decontaminated until any embedded radioactive shrapnel is removed.)

4. Undergo decontamination if external contamination is known or suspected to have occurred. Persons with external contamination should undergo evaluation for internal contamination.

- If skin, hair, or clothing is potentially contaminated with radioactive material (external contamination), undergo decontamination as quickly as this can reasonably be done.

- Decontamination normally includes careful removal (and bagging) of clothing plus showering with warm (not hot or cold) water and soap, followed by putting on clean, non-contaminated clothing.

- If unable to immediately shower, remove outer clothing and, if water is available, wash hands, face, and other exposed areas (i.e., areas which had not been covered by clothing), or wipe with moist towels or disposable baby wipes. As soon as possible, take a full shower with warm water and soap.

- Decontamination can occur at special decontamination sites that may be set up by emergency response officials following the occurrence of a radiological incident such as a dirty bomb explosion. Decontamination can also occur at home, at a Community Reception Center (CRC), or (for those who are injured or sick) at a medical care facility.
  - Particularly in a large incident, uninjured but potentially contaminated persons may be told by public health/emergency response officials to go home, remove and bag their clothes, shower with soap and warm water, and then listen to local TV or radio stations for instructions on any additional actions they may need to take.
  - Since it will likely be at least 1-2 days before a CRC can be set up, potentially-contaminated individuals should not wait until a CRC opens to undergo decontamination. When a CRC does open, these persons can, if recommended to do so, go there and be monitored for any remaining external contamination.
contamination, and undergo further decontamination if necessary. Evaluation for possible internal contamination can also take place.

- **Specific actions:**
  - If undergoing decontamination at a public decontamination site, follow the instructions provided.
  - If undergoing self-decontamination at home or in a similar location:
    - Limit movement within the building until clothing is removed and showering completed in order to minimize the spread of contamination. If at home, remove and bag clothing (see below) before entering the house (e.g., in the garage).
    - Carefully remove clothing (so as not to spread contamination) and place it in a sealed plastic bag (e.g., a garbage bag). Bagged clothing should be placed in a location where people and animals will not come into contact with it. Authorities will be providing instructions on its disposition.
    - Gently blow nose, wipe eyelids, and clean out ears.
    - Shower thoroughly with warm (not hot or cold) water and mild soap, allowing the water to run away from the face. Do not use hair conditioners or shampoos that contain hair conditioners. Keep soap and shampoo out of the eyes, ears, nose, and mouth, and take care not to abrade the skin.
    - Change into clean clothing.
    - Wash out tub or shower.
    - Tune in to local TV/radio stations for further instructions from public health and emergency response officials.
  - For additional instructions on decontamination at home, see the following:
    - [https://emergency.cdc.gov/radiation/pdf/infographic_decontamination.pdf](https://emergency.cdc.gov/radiation/pdf/infographic_decontamination.pdf)
  - If recommended to do so, go to a CRC for screening for external and internal contamination, and for further decontamination if necessary.

5. **If injured by the explosion, seek (or be transported to) medical care.**

6. **If uninjured but near the explosion site, contact a medical provider or (once local officials indicate it is safe to do so) seek medical evaluation if acute radiation syndrome (ARS) symptoms (e.g., nausea, vomiting) develop. Persons who are asymptomatic and uninjured should not go to an emergency room to be evaluated for radiation exposure/radioactive contamination. If necessary, evaluation can occur at a CRC.**

- In general, a dirty bomb explosion is not expected to produce enough radiation to cause ARS, except possibly in a small number of persons who were very close to the explosion.

- More information on ARS is found at [https://emergency.cdc.gov/radiation/arsphysicianfactsheet.asp](https://emergency.cdc.gov/radiation/arsphysicianfactsheet.asp) and [https://www.remm.nlm.gov/exposureonly.htm#skip](https://www.remm.nlm.gov/exposureonly.htm#skip).

- **Specific actions:**
  - Uninjured persons who were close to the site of the explosion should (in addition to undergoing necessary decontamination) contact a medical provider or seek medical evaluation if nausea or vomiting occurs anytime in the days following the explosion.
Persons who are asymptomatic and uninjured should not go to an emergency room to be evaluated for radiation exposure/radioactive contamination (unless directed to do so by public health/emergency response officials). This will prevent emergency rooms from becoming overcrowded and unable to provide optimal emergency care to those who need it. Depending on the situation, asymptomatic and uninjured persons may be directed by local public health/emergency response officials to go to a CRC for evaluation.

7. If recommended to do so by local public health/emergency response officials, go to a CRC for assessment/monitoring (including evaluation for external and internal contamination) and, if needed, further decontamination. The CRC will also provide, as necessary, referral for additional medical evaluation/care and follow-up. In addition, education will be provided and questions can be addressed.

- For asymptomatic and uninjured persons, an assessment for radiation exposure/radioactive contamination is best conducted at a CRC if the incident is large and many persons are affected. It is anticipated that part of the response to such an incident will be to set up one or more CRCs in the community as needed.

- It will probably be 2-3 days following the explosion of a dirty bomb before CRCs can be set up and become operational.

- Public health/emergency response officials will be providing information on the establishment of CRCs, and on who is recommended to go there for evaluation. (More information on CRCs is available at http://www.orau.gov/rsb/vcrc/.)

- Specific actions:
  - Monitor local TV/radio stations and/or local health department websites for information and guidance regarding CRCs.
  - If directed to do so, go to a CRC for evaluation and, if needed, decontamination. Follow any recommendations provided regarding medical follow-up.

B. Interventions at the Community Level

1. Properly manage the scene of the explosion, including radiation monitoring, establishment of safe areas/zones of response, triage and initial medical treatment of the injured, and transport of the injured to a medical facility. Conduct screening and decontamination of individuals as resources allow, or provide instructions for home decontamination.

- Two very important sources of guidance for planners and responders are the following. Much of the material in this section was taken from the recommendations provided here.
  1) Radiation Emergency Medical Management (REMM): Initial On-site Activities, available at http://www.remm.nlm.gov/onsite.htm#victims. See the second figure in Appendix E for an example of the layout of response facilities/locations in a radiological emergency, and the third figure for an example of how patient handling flow might be conducted.

- Among the specific actions that should be taken whenever it is discovered that an explosion has released radiation/radioactive materials into the environment are the following (some of these actions have likely already been initiated before the presence of radioactive material is recognized). Note that it is necessary to refer to the three references mentioned above for more specific guidance):
  - Establish Incident Command.
- Contact appropriate authorities, including local/state radiation control programs.
- Ensure the safety of personnel responding to the incident
  - Responders should use appropriate PPE and personal dosimeters
  - Utilize recommended radiation exposure guidelines, including those pertaining to stay times.
  - Radiation exposure of responders should be closely monitored. Incident managers should ensure that appropriate exposure guidelines are followed.
- Control the scene and establish safe areas/zones of response. Continuously measure levels of radiation throughout the area.
  - Safe areas/zones of response are established in order to protect responders and the public from unnecessary exposure to radiation.
  - Establishing safe areas will involve setting “decision area boundaries,” controlling access, and surveying people and objects to determine if they are contaminated with radioactive material.
- Rescue the injured.
- Establish patient handling flows. Provide triage, and emergency treatment and transport of the injured to a medical facility.
  - The triage process should, besides the assessment of individuals for injuries and serious acute illnesses, also include the identification and prioritization of these persons for external contamination screening, and the identification and prioritization of a subset of these individuals for internal contamination screening and any necessary medical follow-up.
  - A geographic zoning approach may be used (e.g., those within a certain radius, or those in a certain city block) to prioritize the population who will receive immediate initial monitoring and assistance with decontamination.
- Screen affected individuals for radioactive contamination and, in addition, provide decontamination, as feasible. However, this is highly dependent on the number of people waiting and the extent of available resources. If more timely decontamination can occur by sending persons not needing immediate medical attention home to self-decontaminate, this action is preferred rather than having them wait for on-scene decontamination that could take significantly longer.
  - If possible, a rapid radiation screening method could be used to isolate those with highest levels of contamination. Here a key goal is to get these highly contaminated individuals out of their clothing immediately, and then get the remaining radioactive material off the body as soon as possible. Also, persons with high levels of contamination are likely to have internal contamination and should be identified as a priority for follow-up for internal contamination.
  - Persons not in need of medical care may be sent home to self-decontaminate if, for example, there is a large crowd that exceeds the local capacity for processing during the early period following the explosion. Levels of external contamination detected during screening can be considered in making decisions on whether a particular individual should be sent home for self-decontamination.

Radiological screening for external contamination is performed to assess the amount of radioactive materials on the skin and clothing. These materials can irradiate the body when beta- and gamma-emitting radionuclides are present. If the radioactive material remains on skin or clothing, it could be released into the air and inhaled, or it could be incidentally ingested, resulting in internal contamination. Also, external contamination on the body can be spread to other people, places, or items, resulting in cross-contamination. Cross-contamination is a public health concern, although it is secondary to immediate concerns for people's health and safety.
• Individuals who are sent home to self-decontaminate will be encouraged to listen to local media for further information and guidance, which may include the recommendation that they go to a CRC for monitoring and, if necessary, further decontamination.

• Decontamination guidelines are available in the documents mentioned above. Some key points are the following:
  - Persons with life threatening injuries, or serious, acute medical conditions, should be treated without regard for contamination/decontamination, and they should be transported to a hospital where they should be immediately admitted if this is necessary for life-saving care. (See page 34 of *The Medical Aspects of Radiation Incidents*, [REAC/TS], at [http://orise.orau.gov/files/reacts/medical-aspects-of-radiation-incidents.pdf](http://orise.orau.gov/files/reacts/medical-aspects-of-radiation-incidents.pdf).)
  - If individuals have non-life threatening injuries but are contaminated, they should be decontaminated before being sent to medical care.
  - For persons undergoing decontamination, their identification, jewelry, money, or credit cards should not be collected. They can try to wash these things as they wash themselves, or the items can be bagged.
  - All contaminated clothing collected before the washing process should be bagged and labeled for further epidemiological and law enforcement purposes.

• If rapid decontamination by showering with warm water and mild soap – which is the best method – cannot be quickly done, people can take other steps by themselves without showering to markedly minimize the levels of external contamination and the likelihood of internal contamination.
  - Plastic garbage bags can be provided to people, along with instructions to carefully remove their outer garments and bag them (especially if clothing has visible dust).
  - If water is available, the hands, face, and other exposed areas (i.e., areas which had not been covered by clothing) can be washed.
  - If no water is available, moist towels or disposable wipes can be provided so that the face and hands can be cleaned while waiting to shower, or before leaving to go home.
  - If possible, clean outer garments should be given to these individuals for warmth.
  - Note that these steps may be preferred to outdoor showering at this stage, especially when temperatures are cold or the number of people is large.
  - These individuals should shower with soap and warm water as soon as this can reasonably be done.

• Record contact information on all persons released to go home or to another location such as a shelter.
  - Initially, the most basic and critical information to collect from each person is his or her name, address, telephone number, and contact information.
  - If time permits, other information can be recorded, including the person’s location at the time of the incident and radiation readings, but this is not essential and should not become a bottleneck in the registration process.
  - This registry information will be used to contact individuals for follow-up activities, if needed.

• Note that the planning process will need to address how the above steps can be quickly and efficiently instituted. Issues such as the following should be addressed:
  - The need to provide plastic bags and clothing to people who are asked to remove and bag their contaminated outer garments before they leave the scene of the incident.
The need for transportation services in the first few hours after an incident for people who have places to go (e.g., their own homes) but no means of transportation to get there.

2. Provide rapid, accurate, and useful information and guidance to: 1) the public, 2) medical providers, 3) on-scene emergency responders, 4) public health officials, 5) elected leaders and other decision-makers, and 6) other persons or groups potentially impacted by the incident. Provide periodic updates as new information and guidance become available.

- If a radiation incident such as a dirty bomb explosion occurs, emergency response/public health officials must be able to quickly provide information and guidance to persons in the affected areas. It should be remembered that fear of radiation is high, perhaps higher than with other agents of terrorism, and that frightened people may not be easily directed or reassured.

- For information and guidance to be provided quickly and effectively, communication strategies and mechanisms, including draft messages for the public and for medical providers, need to be carefully developed before an incident occurs. It should be emphasized that the ability to rapidly provide instructions to the public and to medical providers will be absolutely crucial.

- During the response to an incident, the information and guidance can be conveyed by local TV and radio stations, Internet sites, newspapers, the Missouri Health Notification System (MO-HNS), and other mechanisms that may be available. It can also be conveyed directly by on-scene emergency responders.

- The information and guidance provided will be updated periodically, and will likely change as the situation changes, and as the situation becomes better understood.

- It is important that communications, including written educational materials, be provided in appropriate languages and literacy levels for the community. People who do not speak English as a first language could have great difficulty in understanding instructions when under the stress of a terrorist incident. Consider visuals, universal signage, or videos to communicate vital information.

- One particular priority in the response effort is to keep those who do not need immediate medical care from overburdening local and area hospitals. One way to help accomplish this would be to identify the time periods and locations where members of the public would have to have been in order to have received an exposure of concern, and then communicating this information to help the public make informed decisions.

- See Appendix F for a brief discussion, taken from a draft CDC document, of some of the issues associated with providing information to the public in a radiation incident.

- Resources for emergency response/public health officials involved in communications planning include:
  - Communicating Radiation Risks (EPA)
  - Crisis & Emergency Risk Communication – CERC (CDC)
    [https://emergency.cdc.gov/cerc/index.asp](https://emergency.cdc.gov/cerc/index.asp)

- Two additional resources, although addressing other types of radiation incidents, provide considerable information that would be helpful in the response to a dirty bomb explosion:
3. Decide on, and rapidly and effectively communicate to those who need to know, recommendations for sheltering in place and/or evacuation. Provide assistance to those who need it in order to carry out these recommendations.

- Local public health/emergency response officials will determine, based on Protective Action Guides (PAGs) and other considerations, which areas should be evacuated and which areas should have persons shelter in place in order to minimize possible exposure to radiation/radioactive materials. Specific recommendations may change over time as radiation levels are more accurately determined, and as the levels of radiation (and other factors) change.

- Especially before ordering an area to be evacuated, consideration should be given to potential problems/unintended consequences of such an action.

- It is likely that some persons who have been told to evacuate will require assistance.

- The planning process must address issues related to settings such as schools, day care centers, hospitals, residential care facilities, and prisons.

- Once shelter in place and evacuation decisions have been made (and also whenever changes occur), guidance will need to be issued quickly and clearly to persons within the affected areas using available means such as TV and radio stations, Internet sites, and on-scene emergency responders. Instructions need to be provided in languages appropriate to the populations affected.


4. Set up a shelter(s) for evacuated (and later for relocated) persons

- Among the situations that the shelter(s) may encounter are the following:
  - Individuals may arrive at the shelter(s) potentially contaminated with radioactive material.
  - Individuals may arrive at the shelter(s) with medial or other special needs.
  - Individuals may arrive at the shelter(s) with their (possibly contaminated) pets/service animals (of all types).
• Policies/protocols and resources must be available to manage these situations.

• See https://emergency.cdc.gov/radiation/pdf/operating-public-shelters.pdf for more information.

5. Conduct ongoing monitoring of the environment with radiation detection equipment. Use the data obtained, in conjunction with appropriate PAGs, in managing the situation – including decisions regarding evacuation/sheltering in place, stay times for responders, relocation of persons living in certain contaminated areas, and remediation of the environment.

• Knowledge of radiation levels in different areas, and how these levels change over time, will be of particular importance to public health/emergency response officials as they provide guidance to responders and to the public that will ensure unacceptably high radiation exposures do not occur. This guidance will likely change over time as the situation changes.

• Such determinations of environmental radiation levels will be very approximate during the early phase of the response, but will become increasingly more precise over time as more and more measurements of radioactivity are obtained.

• In addition to local and state capabilities, Federal agencies have considerable capability to monitor and sample a contaminated area, analyze data, and provide recommendations on appropriate actions that should be taken. This monitoring is performed by an organization known as the Federal Radiological Monitoring and Assessment Center (FRMAC), coordinated by the Department of Energy (DOE) and supported by a number of Federal agencies. FRMAC can be activated, in full or in part, by a request from a state for such assistance, and can be set up in the vicinity of a radiological incident.

• To assist with issues involving human and animal health, and environmental impacts, Federal agencies can activate an organization known as the Advisory Team for Environment, Food and Health (Advisory Team). (See http://www.crcpd.org/resource/resmgr/ATeam/Ateam.htm.) This is a radiological emergency response group whose mission is to provide coordinated advice and recommendations for the Federal, State, local and tribal governments in radiation emergencies. The permanent membership includes representatives from EPA, FDA, CDC, and USDA. The Advisory Team can provide advice in matters related to:
  - Environmental assessments (field monitoring) required for developing recommendations with advice from State, local, and tribal governments and/or FRMAC.
  - PAGs and their application to the emergency.
  - Protective action recommendations using data and assessments from FRMAC.
  - Estimated effects of dispersed radioactive material on human health and the environment


6. Restrict movement and/or certain activities within affected areas as needed.

• Authorities may choose to restrict movement and/or certain activities within areas that are contaminated in order to prevent further unnecessary exposure to radioactive materials by the public, prevent further dispersal of radioactive materials in the environment, and ensure that response personnel can have easy access in order to carry out their necessary tasks.

• Once decisions on restricting movement and/or prohibiting certain activities have been made, guidance will need to be issued quickly to all persons who will potentially be impacted.
7. Ensure appropriate PPE and personal dosimeters are utilized by all responders, medical personnel, and others who may have contact with contaminated environments and/or persons. These responders, medical providers, etc. should be properly monitored for the presence of radioactive contamination and radiation exposure, and managed accordingly. Recommended stay times should be enforced when working in contaminated areas. In addition, ensure proper technique is practiced by responders and medical personnel when assisting or caring for all contaminated persons and contaminated decedents. Particular caution is needed when caring for those with embedded shrapnel.

- Guidance to help ensure the safety of responders at the scene of a radiation incident is found at: http://www.remm.nlm.gov/onsite.htm.

- Guidance on the use of personal protective equipment (PPE) by first receivers (hospital healthcare workers) when handling contaminated victims is available at http://www.remm.nlm.gov/radiation_ppe.htm#firstreceiver.

- Guidance for managing patients with embedded foreign bodies (shrapnel) is found at http://www.remm.nlm.gov/ext_contamination.htm#shrapnel.


8. Carry out medical evaluation and, as necessary, treatment and follow-up of affected persons in accordance with current guidelines.

- Anticipate that most medical providers and medical facilities will not be knowledgeable regarding the management of victims of a radiological incident, and particularly if there are large numbers of potentially-affected individuals presenting for evaluation and care. Consequently, providers and facilities will need guidance, including the opportunity for medical consultation with radiation experts.

- The highest treatment priority is for persons who have life-threatening injuries or who are otherwise in need of immediate medical care (e.g., heart attack). All seriously injured patients (and patients with other life-threatening medical conditions) should be medically stabilized before radiation exposure/contamination and decontamination are considered. While the patient is being stabilized, appropriate steps should be taken to prevent contamination of medical staff and the area where this initial treatment is taking place. See http://www.remm.nlm.gov/hospitalprep.htm, and http://www.remm.nlm.gov/radiation_ppe.htm#firstreceiver.

- The triage process should identify and prioritize affected persons for external contamination screening, and identify and prioritize a subset of these individuals for detailed NPI evaluation.

All seriously injured patients (and patients with other life-threatening medical conditions) should be medically stabilized before radiation exposure/contamination and decontamination are considered.

It is important to remember that “radiologically contaminated patients generally pose no danger to health care personnel. It is virtually impossible for a living patient to be so contaminated as to pose an acute threat to health care providers.” (REAC/TS. The Medical Aspects of Radiation Incidents, page 34.)

“All the radiation exposure hazard from a radiologically contaminated casualty will very likely be negligible, so necessary medical or surgical treatment must not be delayed because of possible contamination. . . . . . . The initial management of a casualty contaminated by radioactive materials is to perform all immediate life/lunssaving actions without regard to contamination. Decontamination should never interfere with medical care and contaminated casualties should not be barred entry to a medical facility if entry is necessary for life-saving care.” (REAC/TS. The Medical Aspects of Radiation Incidents, page 34.)
internal contamination screening and, if needed, medical follow-up.

- The U.S. Department of Health and Human Services (HHS) has developed a very important tool entitled Radiation Emergency Medical Management (REMM), which provides comprehensive guidance for medical care providers on the clinical diagnosis and treatment of radiation injury during radiological emergencies. It is available at http://www.remm.nlm.gov/index.html.


- In 2013, the Missouri Department of Health and Senior Services (DHSS) issued an updated Health Guidance document entitled “Management in a Hospital Setting of Persons Contaminated with Radioactive Material and Exposed to Radiation Following a Dirty Bomb Explosion – 2013.” It provides information and guidance on certain key issues that medical facilities and providers must be prepared to immediately address should a dirty bomb explosion occur in their area. It is found at http://health.mo.gov/emergencies/ert/alertsadvisories/pdf/hg10213.pdf.


- Information for health professionals on managing victims of explosions is found at http://emergency.cdc.gov/HAN/han00346.asp.

- Expert medical consultation on the management of victims of radiation incidents is available 24/7 from REAC/TS. Their emergency number is 865/576-1005.

- Additional points for medical facilities:
  - Planning and training for radiological incidents must take place before such an incident occurs.
  - In planning for, and responding to, radiological incidents, hospitals should always make full use of their own staff members who have radiation expertise (i.e., those who work in radiology and radiation oncology).
  - Some hospitals establish an arrangement with the local fire department to have the latter provide assistance with radiation detection and/or decontamination. If such an arrangement is in place, the hospital should have a back-up plan in case (particularly in a large incident) all fire department resources are tied up at/near the scene of the incident, and thus are unable to assist the facility.
  - It should be remembered that it will be hours before any state assets arrive, and probably at least 12 hours and possibly longer before initial Federal assets begin to appear. During this period, facilities must use local resources in their response.
  - It is important to emphasize that people tend to be frightened of radiation, and this is as true of healthcare workers and other hospital employees as it is of the general public. If hospital staff members (both clinical and non-clinical) do not have a proper understanding of radiation, and the fact that the hospital’s response to a radiological incident can proceed without placing them personally at risk, many of these individuals may not report to work because of concerns about their own safety or that of their families. Consequently, when a facility conducts trainings and exercises on radiation events, it is crucial to involve not only clinical staff but also non-clinical personnel (e.g.,
maintenance, janitorial, food service, security, logistics/supply, and other workers) whose presence during a major incident would be essential for the hospital to function.

- Specific resources and guidance for pre-hospital settings/first responders are also available, including:
  - First Responders in the Field (REMM)
    https://www.remm.nlm.gov/ remm FirstResponder.htm
  - Managing Radiation Emergencies: Guidance for Prehospital Emergency Services (REAC/TS)
    http://orise.orau.gov/reacts/guide/manage.htm

9. Conduct population monitoring including, as necessary, the establishment and operation of CRCs. CRCs can conduct assessment for radiation exposure and external/internal contamination, provide decontamination if needed, and refer, as necessary, for further medical evaluation/care and follow-up.

- Population monitoring is essentially the process of identifying, screening, and monitoring people for exposure to radiation and/or contamination with radioactive materials. The objectives of the population monitoring process are the following:
  - 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 (see #12 below).

- Many critical components of population monitoring should be put in place in the first few hours after the incident, before the arrival of federal assets that might be used to assist in the monitoring efforts.

- Population monitoring continues until all potentially-affected people have been monitored and evaluated for the following:
  - Needed 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 contamination (decontamination) and the treatment, if necessary, of internal contamination.
  - The radiation dose received and the resulting health risk from the exposure
  (For persons who have received radiation exposure, it will be important for them to be monitored and evaluated for long-term health effects, and this will involve appropriate long-term medical follow-up. These individuals will be entered into a registry, and may become part of an epidemiologic investigation that will likely span several decades.)

- The population to be monitored includes the people in the affected community. Be aware that many people in the affected area will likely request assessment and treatment from public health authorities, hospitals, and medical providers. Other people from outside the area who were not exposed or contaminated may also request evaluation to confirm their condition or seek reassurance.
• Pets may additionally need to be included in response activities because many people consider them part of their families and will make decisions on that basis. It is important to determine in advance how pets will be handled and how this will affect the population monitoring process.

• Local public health officials may set up one or more CRCs to assess people for radioactive contamination (external and internal) and radiation exposure, perform decontamination as needed, refer persons for further medical evaluation and care as needed, answer questions, and make other necessary referrals.
  - Depending on available resources, individuals presenting to a CRC who are judged to be at risk of significant internal contamination may be able to provide clinical specimens (e.g., urine) while at the CRC for laboratory testing.
  - In some instances, again depending on resources as well as the isotope(s) involved, persons believed to have significant levels of internal contamination may be provided with an initial dose of a medical countermeasure (e.g., Prussian blue) while at the CRC, and then referred for additional medical evaluation/treatment.
  - Facilities designated for use as alternate care sites or points of dispensing (PODs) may be used for CRC operations with some additional staffing and resources.

• Very important guidance on population monitoring in radiation emergencies, including the establishment of CRCs, is found in Population Monitoring in Radiation Emergencies: A Guide for State and Local Public Health Planners (2nd Edition) from CDC; it is available at https://www.emergency.cdc.gov/radiation/pdf/population-monitoring-guide.pdf. In addition, comprehensive information on CRCs is found at http://www.orau.gov/rsb/vcrc/.

10. Provide guidance on drinking water and food.

• Following a dirty bomb explosion, the safety of water and food in the affected areas will need to be determined, and information and recommendations provided to those potentially affected.

• The Advisory Team for Environment, Food and Health (Advisory Team), with members from several Federal agencies, can provide advice in matters related to:
  - Protective actions to prevent or minimize contamination of milk, food, and water, and to prevent or minimize exposure through ingestion.
  - Availability of food and water supply inspection programs to assure wholesomeness.
  - Recommendations regarding the disposition of contaminated foods, especially perishable commodities (e.g., meat in processing plants).

• Information and guidance on monitoring radionuclides in drinking water and food are found at:

11. Provide adequate behavioral health and mental health services.

• Psychosocial issues will present significant challenges to public health and medical practitioners both during and after a radiation emergency. The psychosocial consequences of radiation emergencies are unique and serious, and in many ways they can be even greater and longer-lasting than the physical or economic consequences. It is important to emphasize that fear of radiation is high, perhaps higher than with other agents of terrorism.
• These issues will affect responders and medical personnel as well as the general public.

• Preexisting behavioral health and mental health services will need to be augmented during a radiological incident such as a dirty bomb explosion.

• Behavioral health and mental health specialists must be included in preparedness planning, and in the response to the incident.

• If possible, behavioral health or mental health professionals should be available at monitoring centers (including all CRCs), medical facilities, staging areas from which responders deploy, and in the affected community in general.

• For more information and guidance, see:
  – [http://dmh.mo.gov/disaster/](http://dmh.mo.gov/disaster/)

12. **Establish a registry that can be used to contact affected persons who require short-term medical follow-up and/or long-term health monitoring.**

• The registry should include information from the following:
  – All members of the public who were potentially contaminated or exposed.
  – All first responders, public health workers, and hospital staff who were potentially contaminated or exposed.

• Basic information to collect would include name, address, telephone number, other contact information, date of birth, and sex. Additional information could include the individual’s relationship to the incident and whether there was known contamination or external radiation exposure.

• The planning process should address confidentiality and potential liability issues associated with registering and collecting data. Determine in advance who will have access to the registry database and how it will be managed and archived.

• Extensive resources will be required for the registration process, and CDC and the Agency for Toxic Substances and Disease Registry (ATSDR) will provide assistance in establishing and maintaining the registry.

• For more information and guidance, see [http://www.remm.nlm.gov/datacollection.htm](http://www.remm.nlm.gov/datacollection.htm).

13. **Provide guidance on management of pets and livestock.**

• Pets and livestock can be affected by both radiation exposure and contamination.

• Information and recommendations need to be provided to pet and livestock owners.

• The Advisory Team for Environment, Food and Health (Advisory Team) can provide advice in matters related to:
  – Availability of animal feed and water supply inspection programs to assure wholesomeness.
Recommendations regarding the disposition of contaminated livestock and poultry.

• Links to resources for managing animals in emergency situations are found at http://www.remm.nlm.gov/remm_PetOwners.htm.

14. Take proper measures regarding agricultural products in the affected areas.

• In the early phase of the incident, a temporary embargo on agricultural products and activities in the affected areas may be put in place following discussions between state and Federal public health and agriculture officials.

• There will be ongoing environmental sampling of agricultural products from the affected (and nearby) areas for evidence of radiation concentrations that exceed those at which continued interventions would be necessary.

• Information and guidance needs to be provided to those potentially affected.


15. Relocate, as necessary, persons from contaminated areas.

• While clean-up/remediation activities are taking place, relocation of persons living in areas with unacceptably high radiation levels will occur. (Relocation specifically refers to a protective action, taken in the post-emergency phase, through which individuals who may or may not have been evacuated during the emergency phase are asked to relocate from a contaminated area to avoid long-term radiation exposure from deposited radioactive materials.)

• Depending on the situation, relocated persons may, on occasion, be allowed temporary re-entry into the restricted zone under controlled conditions.

• The Advisory Team for Environment, Food and Health (Advisory Team) can provide advice in matters related to relocation, re-entry, return, and other radiation protection measures prior to recovery.


16. Conduct clean-up/remediation of contaminated areas.

• Clean-up/remediation of the areas contaminated with radioactive material will be undertaken to reduce radiation in the environment to acceptable levels so that persons can return to their homes and places of employment.

• This process may take months or years to complete, and it will be expensive.

• Decisions will have to be made regarding what residual radiation levels are acceptable, and how best to conduct the clean-up/remediation process. These decisions will ultimately be made by elected public officials, in consultation with technical experts, and with input from persons living in the contaminated areas or who will otherwise be directly affected by the decisions. The goal is to develop sound, cost-effective cleanup strategies that are protective of human health and the environment.
• The Advisory Team for Environment, Food and Health (Advisory Team) can provide advice in matters related to recovery and cleanup issues.

Section 5

Relationship of NPIs to Medical/Pharmaceutical Interventions

Section 5 briefly describes the relationship of NPIs to medical/pharmaceutical interventions.
Relationship of NPIs to Medical/Pharmaceutical Interventions

• The radioactive material in a dirty bomb consists of one or more radioactive isotopes (i.e., radioisotopes). If a person becomes internally contaminated with significant amounts of certain radioisotopes, then medications (e.g., Prussian blue, DTPA) may be used to reduce the time that the isotope stays in the body, thus reducing the amount of radiation exposure to cells. Such medications, also known as medical countermeasures, do not reverse any damage to cells that has already taken place.

• Following a dirty bomb explosion which results in large numbers of persons with potential internal contamination, there may be some delay in determining who will need to be given a medical countermeasure, and then in getting these individuals started on the drug (this assumes, of course, that an effective medical countermeasure[s] exists for the isotope[s] used in the bomb).

• Some persons near the site of the explosion might receive enough external radiation exposure to result in their developing symptoms of ARS. Given the levels of radiation exposure likely after a dirty bomb explosion, the main concern in these individuals would be radiation damage to the bone marrow leading to lymphopenia, neutropenia, and decreased platelets – and subsequent increased susceptibility to infection, sepsis, hemorrhage, and impaired wound healing. Medical management would emphasize supportive care of the person until there is recovery of blood cell (neutrophil and platelet) production. In addition to supportive care, individuals with moderate to severe levels of radiation exposure would likely be given medications called colony-stimulating factors (CSFs), to enhance hematopoietic recovery. Unless the radiation dose received is extremely high, ARS can often be successfully treated, although this process can be lengthy and resource-intensive.

• Links to information and guidance on the use of pharmaceutical interventions in treating persons with radioactive contamination/radiation exposure (as well as on the general medical management of these individuals) are found at http://health.mo.gov/emergencies/ert/med/guidance.php and http://health.mo.gov/emergencies/ert/med/nucmisc.php.

• Key points: Minimizing radiation doses by taking advantage of the basic features of radiation protection (i.e., time, distance, shielding) is much more effective than subsequent medical treatment and countermeasures. Even though certain medical countermeasures are available, this does not lessen the need to quickly institute NPIs such as those discussed in this document so that individuals can minimize external radiation exposure as well as contact with radioactive material, and thus avoid or greatly reduce the subsequent risk of developing significant medical problems.
Section 6

Statutory/Regulatory Authorities

Section 6 provides information on statutory/regulatory authorities that might be applicable during the response to a dirty bomb incident.
Statutory/Regulatory Authorities

This is a collection of known, applicable Missouri laws, rules and regulations that could have an impact on public health officials’ ability to prevent, respond to, and assist in the recovery from a dirty bomb explosion.

The following statutes or rules listed may be summarized for the purpose of this document.

To read the entire text of each statute, visit the Missouri General Assembly’s website at:
http://www.moga.mo.gov/index.html

To read the entire text of each rule, visit the Missouri’s Secretary of State’s website at:
http://www.sos.mo.gov/adrules/csr/csr

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Missouri Statutes

Powers and duties of department.
192.410. The department of health and senior services shall:

(1) Develop comprehensive policies and programs for the evaluation and determination of hazards associated with the use of radiation and for their abatement or elimination;

(2) Employ, and, if necessary, train the personnel needed to carry out the provisions of sections 192.400 to 192.490;

(3) Advise, consult and cooperate with other agencies of this state, the federal government, other states, and interstate agencies, and with affected groups, political subdivisions and industries in furtherance of the purposes of sections 192.400 to 192.490;

(4) Accept and administer loans, grants or other funds or gifts from the federal government and from other sources, public or private, for carrying out any of its functions;

(5) Encourage, participate in or conduct studies, investigations, training, research and demonstrations relating to the control of radiation hazards, the measurement of radiation, the effects on health of exposure to radiation and related problems as it may deem necessary or advisable for the discharge of its duties under sections 192.400 to 192.490 or for the protection of public health;

(6) Collect and disseminate information relating to the determination and control of radiation exposure and hazards;

(7) Review and approve plans and specifications for radiation sources submitted pursuant to rules and regulations promulgated under sections 192.400 to 192.490;

(8) Inspect radiation sources, their shielding and immediate surroundings and records for the determination of any possible radiation hazard and may examine any records or memoranda pertaining to the question of radiation machines and the use of radioactive materials.

Radiation sources to be kept safe.
192.430. All sources of radiation shall be shielded, transported, handled, used and kept so as to prevent all users thereof and all persons within effective range of them from being exposed to unnecessary radiation.

Emergency orders--compliance required--hearing.
192.460. Whenever the department of health and senior services finds that an emergency exists requiring immediate action to protect the public health or welfare, it may issue an order reciting the existence of an emergency and requiring that such action be taken as it deems necessary to meet the emergency. The order shall be effective immediately. Any person to whom the order is directed shall comply therewith immediately, but on application to the
To safeguard the health of the people of Missouri--certain diseases to be included on communicable or infectious disease list.

192.020. 1. It shall be the general duty and responsibility of the department of health and senior services to safeguard the health of the people in the state and all its subdivisions. It shall make a study of the causes and prevention of diseases. It shall designate those diseases which are infectious, contagious, communicable or dangerous in their nature and shall make and enforce adequate orders, findings, rules and regulations to prevent the spread of such diseases and to determine the prevalence of such diseases within the state. It shall have power and authority, with approval of the director of the department, to make such orders, findings, rules and regulations as will prevent the entrance of infectious, contagious and communicable diseases into the state.

Diseases, control of--condemnation for public facilities--police jurisdiction, city-owned property.

79.380. The board of aldermen may make regulations and pass ordinances for the prevention of the introduction of contagious diseases in the city, and for the abatement of the same, and may make quarantine laws and enforce the same within five miles of the city. They may purchase or condemn and hold for the city, within or without the city limits, or within ten miles therefrom, all necessary lands for hospital purposes, waterworks, sewer carriage and outfall, and erect, establish and regulate hospitals, workhouses, poorhouses, airports and provide for the government and support of the same, and make regulations to secure the general health of the city, and to prevent and remove nuisances; except that the condemnation of any property outside of the city limits shall be regulated in all respects as the condemnation of property for railroad purposes is regulated by law. The police jurisdiction of the city shall extend over such land and property to the same extent as over other city property, as provided in this chapter.

Missouri Regulations

19 CSR 20-20.050 Quarantine or Isolation Practices and Closing of Schools and Places of Public and Private Assembly

PURPOSE: This rule provides for the isolation or quarantine of persons and animals with a communicable disease and their contacts; it also authorizes the closing of schools and places of public and private assembly.

(1) The local health authority, the director of the Department of Health and Senior Services or the director's designated representative shall require isolation of a patient or animal with a communicable disease, quarantine of contacts, concurrent and terminal disinfection, or modified forms of these procedures necessary for the protection of the public health. The isolation of a patient, animal or contact shall be carried out according to the methods of control in 19 CSR 20-20.040(1).

(2) No person or animal infected with or suspected of having a communicable disease listed in 19 CSR 20-20.020(1)-(3) or any contact of a disease subject to quarantine or isolation shall move or be moved from one (1) health jurisdiction to another, unless necessary for medical care, without notice to and consent from the local health authority, the director of the Department of Health and Senior Services or the director's designated representative. If a person is moved for the reason of medical care, the health authority who ordered the isolation or quarantine shall be notified within seventy-two (72) hours.

(3) The local health authority, the director of the Department of Health and Senior Services or the director's designated representative is empowered to close any public or private school or other place of public or private assembly when, in the opinion of the local health authority, the director of the Department of Health and Senior Services or the director's designated representative, the closing is necessary to protect the public health. However, in a statewide pandemic, only the director of the Department of Health and Senior Services or the director's designated representative shall have the authority to close a public or private school or other place of public or private assembly. The director or designated representative shall consult with the local health authorities prior to any such closing. Any school or other place of
public or private assembly that is ordered closed shall not reopen until permitted by whomever ordered the closure.

19 CSR 20-20.020 Reporting Communicable, Environmental and Occupational Diseases

PURPOSE: This rule designates the diseases, disabilities, conditions and findings that must be reported to the local health authority or the Department of Health and Senior Services. It also establishes when they must be reported.

(1) The diseases within the immediately reportable disease category pose a risk to national security because they: can be easily disseminated or transmitted from person to person; result in high mortality rates and have the potential for major public health impact; might cause public panic and social disruption; and require special action for public health preparedness. Immediately reportable diseases or findings shall be reported to the local health authority or to the Department of Health and Senior Services immediately upon knowledge or suspicion by telephone (1-800-392-0272), facsimile or other rapid communication.

Immediately reportable diseases or findings are—

(B) Instances, clusters, or outbreaks of unusual diseases or manifestations of illness and clusters or instances of unexplained deaths which appear to be a result of a terrorist act or the intentional or deliberate release of biological, chemical, radiological, or physical agents, including exposures through food, water, or air.
Section 7

Appendices

Appendix A – Dirty Bombs and the Response to a Dirty Bomb Explosion
Appendix B – Radiation Hazards and Medical Management of Radiation Victims
Appendix C – Medical Response to a Dirty Bomb Explosion
Appendix D – Glossary of Radiological Terms
Appendix E – Guiding Principles in Planning for the Response to a Radiation Incident
Appendix F – Flow Chart for Responding to a Radiological Dispersal Device (RDD)
Appendix G – Providing Accurate, Timely Public Information During a Radiological Incident
DIRTY BOMB OR RADIOLOGICAL DISPERSAL DEVICE

What is a dirty bomb?
A dirty bomb is a mix of explosives, such as dynamite, and radioactive powder or pellets. It is also known as a radiological dispersal device (RDD).

When the bomb explodes, the blast carries radioactive material into the surrounding area.

What are the dangers from a dirty bomb?
The main danger from a dirty bomb comes from the explosion, not the radiation. The explosion can cause serious injuries and property damage. People nearby could be injured by pieces of radioactive material from the bomb. Only people who are very close to the blast site would be exposed to enough radiation to cause immediate serious illness. However, the radioactive dust and smoke can spread farther away and could be dangerous to health if people breathe in the dust, eat contaminated food, or drink contaminated water. People injured by radioactive pieces or contaminated with radioactive dust will need medical attention.

What should I do to protect myself?

GET INSIDE  STAY INSIDE  STAY TUNED

http://emergency.cdc.gov/radiation

https://emergency.cdc.gov/radiation/pdf/infographic_radiological_dispersal_device.pdf
Dirty Bombs and the Response to a Dirty Bomb Explosion

1. Dirty Bombs
   - A **dirty bomb** consists of conventional explosives plus radioactive material.

   ![Diagram of a dirty bomb](source)

   Source: Radiation Emergency Medical Management (REMM)

   - It is one type of **radiation dispersal device (RDD)**, and is sometimes called an explosive RDD.
   - A dirty bomb has been termed a **weapon of mass destruction**. It is not a nuclear bomb or improvised nuclear device (IND). Detonation of a nuclear bomb or IND, as compared to a dirty bomb, would cause enormously greater amounts of physical destruction and radiological hazard, and the numbers of injuries and deaths would likewise be enormously greater.

2. Destructive Effects of the Explosion
   - The explosion can cause serious injury and death to those nearby, as well as damage to buildings, vehicles, and other environmental structures.

3. Dispersal of Radioactive Material
   - The explosion will also disperse radioactive dust and debris into the air where the wind can carry it for a distance of several blocks to miles. This dispersal is in the form of a **plume**, represented in the figure below.

   ![Map showing dispersal](source)

   Source: Interagency Modeling and Atmospheric Assessment Center (IMMACC)

   - As the radioactive material falls to earth, it can contaminate the environment (buildings, vehicles, road surfaces, etc.), as well as people, animals, and plants, over an area ranging from a few square blocks to many square miles.
   - High levels of radioactivity will only be found near the explosion site; the farther out one goes from this location, the lower the amount of radioactivity in the environment.
   - Radiation levels on inanimate surfaces, and on people’s skin and clothing, can be measured by emergency response and public health personnel with appropriate detection equipment.

   ![Radiation detection equipment](source)

   Source: Oak Ridge Institute for Science and Education (ORISE)

   - Following a dirty bomb explosion, monitoring of the environment with radiation detection equipment will take place. The information obtained through such monitoring will help emergency officials determine the boundaries of the contaminated area, and the levels of radioactivity throughout this area. Such determinations will be very approximate during the early phase of the response, but will become increasingly precise over time as more and more measurements of radioactivity are taken.

   - Emergency response personnel and other persons responding to the event will use appropriate protective clothing and other equipment, and will be continually monitored to ensure that they do not exceed established limits to radiation exposure.

4. Evacuation vs. Sheltering in Place
   - Once it is determined that the explosion has released radioactive material into the environment (i.e., that the explosion was caused by a dirty bomb), local emergency officials may require evacuation of the area surrounding the explosion site to make sure that no one is exposed to high radiation levels.
   - Persons farther out from the explosion site may, during the emergency phase of the event, be told to shelter in place (i.e., stay inside) until it is determined that it is safe for them to come out. The primary purpose for sheltering in place is to minimize exposure to radioactive material that was dispersed by the explosion.
   - The boundaries of the evacuation area, and of the area in which persons are told to shelter in place, will likely change over time as emergency officials get more information on radiation levels and other factors.

5. Radiation-Associated Illness (Acute Radiation Syndrome) Beginning in the Hours to Days Following a Dirty Bomb Explosion
   - For radiation-associated illness to occur in the hours to days following radiation exposure, the radiation dose received would have to be relatively large, and it would have to occur over a short period of time.
   - In general, a dirty bomb is not expected to produce enough radiation to cause this type of illness (known as **acute radiation syndrome** or ARS) except possibly in a small number of persons who were very close to the explosion.
   - Early symptoms of ARS include nausea and vomiting. Radiation damage to the bone marrow can cause the person to be at risk for serious infections until the bone marrow is able to recover.
   - ARS, if it does occur, can be diagnosed and (unless the radiation dose is extremely high) successfully treated.

6. External Contamination
   - People who get radioactive material on their skin and clothing (i.e., are **externally contaminated**) are not in any immediate life-threatening danger, but they should, as soon as possible, remove and bag their clothing, and then take a shower with soap and warm water.
   - This process of decontamination should, if done carefully, essentially eliminate further risk from external contamination.
   - The location(s) where decontamination will take place following a dirty bomb explosion will depend on the number of persons who potentially have external contamination, the availability of resources to provide decontamination, and other factors. Local emergency responders may set up sites where potentially exposed persons can come for radiation monitoring and decontamination. However, in a large event, uninjured but potentially contaminated persons may be told to go home, remove and bag their clothes, shower with soap...
and warm water, and then listen to local TV or radio stations for instructions on any additional actions they may need to take.

7. Internal Contamination
   - A main risk from external contamination with radioactive material is that this material could be taken into the body (leading to internal contamination) through inhalation, ingestion, or entry through a break in the skin.
   - Once the material is inside the body, the radiation it emits can damage cells and tissues, which can cause the person to be at some increased risk for the subsequent development of cancer (years to decades later).
     - The risk of subsequently developing cancer increases with increasing levels of radiation exposure.
     - It is very important to remember that simply because a person has some degree of internal contamination does not necessarily mean he/she will later develop cancer.
   - Note that the radioactive material stays inside the body until it is removed by natural processes (e.g., in the urine) or by medical countermeasures (e.g., certain medications).
     - Medical countermeasures function to reduce the amount of internal contamination present.
     - Whether or not a person with internal contamination is treated with a medical countermeasure will depend on: 1) the type of radioactive material (i.e., the isotope or isotopes) involved, and 2) the amount of internal contamination estimated to be present.
     - Not everyone with internal contamination will require treatment with a medical countermeasure, particularly if the level of contamination is very low.

8. Provision of Information and Recommendations to Those Affected By or Involved With the Incident
   - Emergency response and public health officials will be providing continually updated information and recommendations to a variety of different groups, including the public, medical providers, government officials, and others.
   - The public will be instructed to listen to local TV or radio stations for the latest information and guidance.

   - Following a dirty bomb explosion that has resulted in large numbers of persons potentially experiencing radioactive contamination and/or radiation exposure, a process termed population monitoring will be conducted by public health officials.
   - The purpose of population monitoring, which will likely take place at locations called Community Reception Centers (CRCs), is to assess people for
     - External contamination with radioactive material. If present, decontamination can be done at the CRC.
     - Significant external radiation exposure.
     - Internal contamination with radioactive material. If an individual is believed to have significant internal contamination, he/she can be referred for further evaluation and necessary treatment. In some instances, initial treatment might take place at the CRC.
     - The need for additional medical care, psychosocial services, and/or other assistance.
   - CRC staff can answer questions, and provide information, instructions, and necessary referral, to all those presenting.

10. Clean-Up/Remediation of the Contaminated Area
    - Clean-up/remediation of the area contaminated with radioactive material will be undertaken to reduce radiation in the environment to acceptable levels so that persons can return to their homes and places of employment.
    - This process may take months or years to complete, and it will be expensive.
    - Decisions will have to be made regarding what residual radiation levels are acceptable, and how best to conduct the clean-up/remediation process. These decisions will ultimately be made by elected public officials, in consultation with technical experts, and with input from persons living in the contaminated area, or who will otherwise be directly affected by the decisions. The goal is to develop sound, cost-effective cleanup strategies that are protective of human health and the environment.
    - While clean-up/remediation activities are taking place, relocation of persons living in areas with unacceptably high radiation levels will occur. (Relocation specifically refers to a protective action, taken in the post-emergency phase, through which individuals who may or may not have been evacuated during the emergency phase are asked to relocate from a contaminated area to avoid long-term radiation exposure from deposited radioactive material.) Depending on the situation, relocated persons may, on occasion, be allowed temporary re-entry into the restricted zone under controlled conditions.

11. Effect of Radioactive Contamination on Agriculture
   - In the early phase of the event, a temporary embargo on agricultural products and activities in the affected area may be put in place following discussions between state and federal public health and agriculture officials.
   - There will be ongoing environmental sampling of agricultural products from the affected (and nearby) areas for evidence of radiation concentrations that exceed those at which continued interventions would be necessary.

12. Summary: Consequences of a Dirty Bomb Explosion
    - The main consequences of a dirty bomb explosion will be: 1) damage from the blast, including blast-related injuries and deaths; 2) the psychological effects on persons who received (or believe they have received) radiation exposure; and 3) economic costs, especially those associated with relocation and clean-up.
    - Some persons who were very near the blast may experience acute radiation illness (i.e., ARS) and will require medical care.
    - Many persons in the affected area may have external contamination, and some may have internal contamination. All individuals with external contamination will need to undergo decontamination, which could take place at a variety of locations. Persons who have had external contamination need to be assessed for internal contamination. In the case of a large event, such assessment will likely occur at a CRC. If the level of internal contamination is judged to be significant, treatment with medical countermeasures may be needed.
    - Persons who have experienced significant levels of internal contamination, or who have received significant amounts of external radiation exposure, can be at some increased risk for developing cancer years to decades later. These individuals will need medical follow-up.

For more information on radiation and radiation events:
General Audiences
http://health.mo.gov/emergencies/ert/nucgen.php
Medical and Public Health Professionals
http://health.mo.gov/emergencies/ert/nucmed.php

April 2012
Appendix B

Radiation Hazards and Medical Management of Radiation Victims

Ionizing radiation (called radiation in this document) is a process by which atoms of various substances get rid of excess energy. Any material that behaves this way is called radioactive. When the nucleus of an atom is unstable, it can emit energy in various ways and settle into a more stable state. This emitted energy usually appears in one or more of these three principal forms:

- **Alpha radiation**, which is a stream of relatively heavy, highly-charged particles. Alphas do not travel far through any medium. They can be stopped by a piece of paper, or the dead outer layer of skin, but if they are taken into the body (by inhalation, ingestion, or absorption through an opening in the skin), they can present a serious internal hazard. (For example, if you inhale radon gas, the radon and its radioactive products emit mostly alphas, which can irradiate lung tissue and seriously increase the risk of lung cancer.)

- **Beta radiation**, which is a stream of lighter-weight, charged particles. Betas travel farther than alphas, but can be stopped by a book or by a thick piece of metal or plastic. Betas, like alphas, present a hazard if taken into the body, and can also present an external hazard if beta-emitting radioactive material is present on the skin.

- **Gamma radiation**, which is similar to X-rays – weightless, uncharged packets of energy that can travel great distances and penetrate most materials. Gammas require substantial shielding, such as lead, concrete, or large amounts of water. Gammas can present a significant external hazard.

None of these forms can be detected by any human senses. Special instruments must be used to detect and measure radiation.

Radiation presents a hazard in one of two ways: contamination, which is radioactive material where it is not wanted (think of getting cinders from a fire on yourself, or breathing them in); and exposure, which is absorption of the energy from the radioactive decay (think of feeling the heat from the fire).

Radiation can cause damage by interfering with cell reproduction. For that reason, organs and systems that involve continual new cell formation (such as the blood-forming organs) are more sensitive to radiation damage than, for example, nerve or brain cells. This also means that children, infants, and fetuses are at greater risk from radiation than adults. Any protective measures should, if possible, focus on preventing radiation exposure to the young.

Radioactive material on skin, hair, or clothing (called external contamination) can be detected by a wide range of instruments, including hand-held...
and portal-type (walk-through) instruments. External contamination can usually be removed easily by washing, or by removing clothing.

A radioactive substance within the body (called **internal contamination**) behaves the same way the non-radioactive form does; for example, radioactive iodine concentrates in the thyroid gland, where it may cause damage. Unlike external contamination, internal contamination may be measured only by specialized instruments such as **whole-body counters**, which measure radioactive material inside the body, or by **bioassay**, in which urine or other samples must be analyzed in a radiation lab. Both of these processes are time-consuming and not widely available.

Removing radioactive material from inside the body is considerably more difficult than removing it from the skin or hair, so it is important to prevent such intake if possible. It is possible to remove some radioactive substances from inside the body by one of the following processes:

- **Blocking:** preventing uptake of radioactive material by a specific organ and thus hastening its elimination from the body
- **Chelation:** binding radioactive material to an agent and hastening its elimination

The Strategic National Stockpile assets include special drugs appropriate for both of these processes.

In some circumstances, such as a nuclear detonation or a deliberate placement of a source in a public area, individuals may receive high levels of radiation exposure to the whole body. If this occurs, the individual may experience **Acute Radiation Syndrome (ARS)**. The symptoms will depend on the level of exposure received. Symptoms are classed into general categories, from lower to higher exposure levels:

- **Hematopoietic,** which affect the blood cells
- **Gastrointestinal,** which affect the lining of the GI system
- **Cutaneous,** which affect the skin
- **Central nervous system,** which affect the brain and nerves

Especially if there are large numbers of victims, it will be important to estimate an individual's radiation exposure in order to triage appropriately – a process called **biodosimetry**. The Radiation Emergency Medical Management (REMM) website ([http://www.remm.nlm.gov/](http://www.remm.nlm.gov/)) describes several convenient tools to estimate radiation exposure, based on the three major methods used:

- **Time from exposure to onset of vomiting (and severity of vomiting)**

  Time to onset of vomiting is easy to observe and well correlated with exposure level: the shorter the time, the greater the exposure. Times less than one hour indicate severely high exposures, from which patients may not recover without heroic methods. Times less than about four hours indicate the need for immediate further evaluation with more precise methods. The problem with relying solely on time to vomiting is that psychological factors may cause vomiting in many different situations, unrelated to radiation.

- **Lymphocyte depletion kinetics**

  If possible, a complete blood cell count with lymphocyte differential should be obtained as soon after exposure as possible, and repeated regularly for several days. How fast the lymphocytes drop is a reliable indicator of radiation exposure. When taking a blood sample for this count, it is important to note the date and time the sample was taken, so that exposure can be estimated accurately.

- **Chromosome aberration cytogenetics**
The number of dicentric chromosomes in peripheral lymphocytes is also a reliable marker, up to higher exposure levels than lymphocyte depletion. Unfortunately, this analysis requires 48 to 72 hours, and the nation’s capability to perform and analyze these tests is limited. The Federal government is researching rapid, field-friendly methods of determining exposure.

Any, or all, of these indicators can be used with the REMM programs, or with the Biodosimetry Assessment Tool from the Armed Forces Radiobiology Research Institute (AFRRI, https://www.usuhs.edu/afri/biodosimetrytools) to give an estimate of exposure and recommendations for treatment. Once exposure has been estimated, treatment generally concentrates on prevention and management of infection, and on restoring bone marrow function and intestinal mucosa. There are several drugs available to treat ARS; one of these, Neupogen, is included in Strategic National Stockpile assets. The Federal government continues to research treatments for radiation injury.

For any accident involving high exposures, health care providers should also seek the assistance of experts such as the Radiation Emergency Assistance Center/Training Site (REAC/TS) at Oak Ridge, TN. REAC/TS provides treatment capabilities and consultation assistance on a 24-hour basis, and can be reached by calling 865/576-3131 (days), or after normal business hours via the DOE Oak Ridge Operations Center at 865/576-1005.

Providers should also remember, and remind their staffs, that ARS patients are not themselves radioactive and present no hazard to their caregivers.

REMEMBER: If you are responding to a radiological accident, your first priority should be to aid in stabilizing patients from their injuries. Your next priority should be to prevent the spread of radioactive material (often called contamination control). Radiation safety experts can advise on protective measures, but universal precautions should be used at a minimum. The American College of Radiology’s advice (given for cleanup but generally applicable) is worth citing here:

“One way to mentally prepare for the task of decontaminating a radioactively contaminated individual is to imagine that you are dealing with someone who has been contaminated with a large amount of bacteria which has a low pathogenic potential such as that contained in raw sewage. The sequence of steps you would follow to perform a safe and effective clean-up is similar in both cases.”

In many radiological scenarios, the hazard to caregivers from the radioactive material is expected to be low. (If an explosion is involved, the blast will likely cause far greater injuries than the radiation.) Nevertheless, especially if the incident is an explosion or detonation, it is possible that patients with life-threatening injuries – who would skip the decontamination process – could provide a source of radiation exposure to caregivers, particularly if they require surgery. A radiation safety expert on hand to monitor the situation can recommend measures to help lower everyone’s exposures.

In any case, responders and caregivers can protect themselves using the three important principles of radiation protection: time, distance, and shielding.

- **Time:** limiting your time near a radiation source reduces your exposure.
- **Distance:** increasing your distance from a radiation source reduces your exposure. If you double your distance from the source, you reduce your exposure to one-quarter of what you would receive at the closer distance.
- **Shielding:** placing appropriate shielding material between you and a radiation source reduces your exposure. For alpha radiation, clothing will do the job. Beta radiation can be stopped by wood or plastic. Gamma radiation will require lead, concrete, water, or other shielding materials.

Reproduced, with minor modifications, from: Public Health Response To Radiological Accidents: A Guide for State and Local Public Health Departments (PREDECISIONAL DRAFT). Developed by the Radiation Studies Branch, Division of Environmental Hazards and Health Effects, National Center for Environmental Health, Centers for Disease Control and Prevention, January 2010.
Appendix C

Medical Response to a Dirty Bomb Explosion

Medical management following a dirty bomb explosion – basic goals:

1. Protect first responders, EMTs, and medical personnel who enter environments with high radiation levels and/or have contact with contaminated persons. Prevent contamination (or further contamination) of treatment areas.

2. Stabilize life-threatening injuries/illnesses first, without regard to contamination.
   - In general, treatment is the same as for any patient with a serious injury or illness.
   - A few caveats exist for situations where there has been significant radiation exposure. Examples include:
     - Triage criteria may change in an event where there are many casualties and limited resources.
     - If radiation dose is >100 rad (1 Gy), complete all surgical procedures within 2 days of the exposure (prior to onset of cytopenias).

3. Evaluate for external contamination and decontaminate if necessary.
   - Evaluation can be done with radiation survey instruments or radiation portal monitors
   - Decontamination priorities are 1) wounds, 2) body orifices around the face, and 3) intact skin. Removal of clothing followed by washing with soap and warm water can, in most instances, essentially eliminate further risk from external contamination.

4. Evaluate for acute radiation syndrome (ARS) – including, as necessary, an estimation of the radiation dose received – and provide treatment if indicated.
   - Evaluation
     - History of the person’s relationship to the dirty bomb event (locations, times, etc.)
     - Signs/symptoms (e.g., vomiting)
     - Neutrophil/lymphocyte ratio at >4 hours post-exposure
     - Serial lymphocyte counts
     - Dicentric chromosome assay
   - Treatment
     - Supportive care in a clean environment
     - Control of symptoms (e.g., vomiting)
     - Prevention and treatment of infections
     - Colony-stimulating factors (CSFs)
     - Stem cell transfusions
     - Platelet transfusions
     - Psychological support

5. Evaluate for internal contamination and provide treatment if indicated.
   - Evaluation
     - History of the person’s relationship to the event (locations, times, etc.)
- Radiation survey instruments
  - Determine location and magnitude of external contamination
  - Allow detection of internal contamination with high-energy beta- and/or gamma-emitting isotopes
- Nasal swabs
- Urine and stool specimens for isotope measurement
- Special instruments that can perform a total body radiation survey (for high energy gamma-emitting isotopes)
- Following a large event, initial estimates of internal contamination may, for many persons, have to be based on the:
  1. history of the person’s relationship to the event, and
  2. results from radiation survey instruments
- Subsequent evaluation can take place in settings such as Community Reception Centers (CRCs)

- Treatment
  - Careful removal of radioactive shrapnel (note time, distance, and shielding)
  - Specific treatments to increase the rate of elimination of certain radionuclides from the body
    - Emetics
    - Gastric lavage
    - Purgatives
    - Pulmonary lavage
    - Diluting agents
    - Decorporation agents
    - Blocking agents to decrease internal deposition of certain radionuclides
  - Decisions on the use of medical countermeasures will be based on: 1) the isotope(s) involved, and 2) the level of internal contamination that is calculated or estimated to be present. Not all persons with internal contamination require treatment.

6. Provide assessment and counseling for potentially exposed pregnant women
- Determine the radiation dose to the fetus
- Determine gestational age
- Provide information on potential effects on the fetus to the mother
- Provide counseling and psychological support

7. Provide evaluation and treatment for persons with conditions such as cutaneous radiation injury

8. Prevent and/or treat adverse psychological responses
- Provision of clear and accurate information (from medical providers, public health officials, government leaders, etc.) can reduce fear and anxiety.
- Careful medical assessment and treatment may provide reassurance to the person.
- Psychological/psychiatric/psychosocial support

9. Provide follow-up of exposed persons for potential development of later health problems (e.g., cancer)
- Periodic medical assessments including cancer screening
- Long-term epidemiological studies

July 11, 2012
**Appendix D**

**Glossary of Radiological Terms**

**Absorbed dose:** The amount of energy deposited by ionizing radiation in a unit mass of tissue is called radiation absorbed dose. It is expressed in units of joule per kilogram (J/kg), which is given the special name gray (Gy). The conventional unit (or non-SI unit) of absorbed dose is the rad. 1 Gy = 100 rad, 1 rad = 0.01 Gy. For more information, see CDC Primer on Radiation Measurement: [http://emergency.cdc.gov/radiation/glossary.asp#primer](http://emergency.cdc.gov/radiation/glossary.asp#primer)

**Activity (radioactivity):** The amount of radioactive material expressed as the number of atoms breaking down per second measured in units called becquerels or curies.

**Acute radiation syndrome (ARS):** A serious illness caused by receiving a large dose of radiation energy that penetrates the body within a short time (usually minutes). The first symptoms include nausea, vomiting, and, in severe cases, diarrhea starting within minutes to days after the exposure and lasting for minutes to several days. These symptoms may come and go and, depending on the dose of radiation, may fully resolve for variable periods of time. ARS victims then become sick again with loss of appetite, fatigue, fever, nausea, vomiting, diarrhea, and possibly seizures and coma. This seriously ill stage may last from a few hours to several months.

Clinically, ARS is very difficult to diagnose in the absence of other data or information from the incident scene because symptoms within the first few hours after high dose radiation exposure are similar to those associated with commonly occurring viral or bacterial illnesses or even high levels of stress. Proper diagnosis of exposure to ionizing radiation (not contamination) and an estimate of the total dose can only be achieved by analysis of the complete blood count (CBC), chromosome aberration cytogenetic biodosimetry, and consultation with radiation experts. For more information, see: [http://emergency.cdc.gov/radiation/ars.asp](http://emergency.cdc.gov/radiation/ars.asp)

**Alpha particle:** One of the primary forms of ionizing radiation, the others being beta particles, gamma rays, x-rays, and neutrons. Alpha particles can be stopped by a thin layer of light material, such as a sheet of paper, and cannot penetrate the outer, dead layer of skin. Therefore, they do not pose a hazard as long as they are outside the body. Protection from this radiation is directed at preventing, or at least minimizing, inhalation or ingestion of the radioactive material.

Alpha particles are difficult to detect because they penetrate only a few inches in air, and most general purpose detection instruments are poorly suited or not usable for detecting alpha particles. If beta or gamma radiation is detected at an incident scene, instruments should be brought in as quickly as possible to determine whether or not alpha-emitting radioisotopes are also present.

**Annual limit on intake (ALI):** The derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the amount of intake that would result in a committed effective dose equivalent of 0.05 sievert (5 rem) or a committed dose equivalent of 0.5 sievert (50 rem) to any individual organ or tissue. The unit of ALI is the becquerel (Bq) or the conventional unit, curie (Ci).

**Background radiation:** This is the radiation that the population is naturally and continually exposed to from natural sources. It consists of radiation from natural sources of radionuclides such as those found in soil, rocks, air, human bodies, and food, as well cosmic radiation originating in outer space.

**Becquerel (Bq):** The international unit describing an amount of radioactivity. One Bq is the amount of a radioactive material that will undergo one decay (disintegration) per second (dps), a very small rate. Industrial sources of radioactivity are normally described in terms of giga-becquerels (GBq), or one billion Bq. The conventional unit for radioactivity is the curie (Ci). 1 Bq = 2.7 x 10^-11 Ci. See Curie.

**Beta particles:** One of the primary forms of ionizing radiation, the others being alpha particles, gamma rays, x-rays, and neutrons. They travel only a few feet in air and can be stopped by a thin sheet of aluminum. However, beta particles of sufficient energy can penetrate the dead skin layer and, if present in large amounts for sufficiently long periods of time, cause burns to the skin and to the eyes. Protection from this radiation is directed at washing the skin with mild soap and water and preventing, or at least minimizing, inhalation or ingestion of the radioactive material.

Beta particles are easier to detect than alpha particles. While most general purpose detection instruments can detect beta particles, the instrument must be within a few yards of a sizeable source. Fortunately, the vast
majority of beta-emitting radioisotopes also release high-energy gamma rays that can be detected at distances of tens of yards.

When radiation is detected at an incident scene, proper instruments should be brought in as quickly as possible to determine whether pure beta-emitting radioisotopes are present or not, followed in turn by alpha monitoring equipment.

**Bioassay (radiobioassay):** An assessment of radioactive materials that may be present inside a person’s body through analysis of the radioactivity in a person’s excreta (primarily urine), known as indirect bioassay, or by detection methods to monitor the gamma radiation emitted from the body, known as direct bioassay.

**Biological half-life:** Once an amount of radioactive material has been taken into the body, this is the time it takes for one half of that amount to be expelled from the body by natural metabolic processes, not counting radioactive decay.

**Contamination (radioactive):** The deposit of radioactive material on the surfaces of structures, areas, objects, or people (where it may be external or internal). External contamination occurs when radioactive material is outside of the body, such as on a person’s skin. Internal contamination occurs when radioactive material is taken into the body through breathing, eating, or drinking. For more information, see: [http://emergency.cdc.gov/radiation/contamination.asp](http://emergency.cdc.gov/radiation/contamination.asp)

**Curie (Ci):** The conventional unit describing an amount of radioactivity. The international unit for radioactivity is the becquerel (Bq). 1 Ci = 3.7 x 1010 Bq. See Becquerel.

**Cutaneous radiation injury (CRI):** The complex syndrome resulting from significant skin exposure to radiation. The immediate effects can be reddening and swelling of the exposed area (like a severe burn), blisters, ulcers on the skin, hair loss, and severe pain. Very large doses can result in permanent hair loss, scarring, altered skin color, deterioration of the affected body part, and death of the affected tissue (requiring surgery). For more information, see: [http://emergency.cdc.gov/radiation/cri.asp](http://emergency.cdc.gov/radiation/cri.asp)

**Decontamination:** Removal of radioactive materials from people, materials, surfaces, food, or water. For people, external decontamination is done by removing the clothing and washing the hair and skin. Internal decontamination is a medical procedure and should be performed at the order and under the guidance of a licensed physician.

**Decay, radioactive:** Disintegration of the nucleus of an unstable atom by the release of radiation.

**Deterministic effects (non-stochastic effects):** Health effects that can be related directly to the radiation dose received (e.g., skin burn). The severity increases as the dose increases. A deterministic effect typically has a threshold below which the effect will not occur. See also stochastic effects.

**Dirty bomb:** A device designed to spread radioactive material by conventional explosives when the bomb explodes. A dirty bomb kills or injures people through the initial blast of the conventional explosive and spreads radioactive contamination over a possibly large area—hence the term “dirty.” Such bombs could be miniature devices or large truck bombs. A dirty bomb is much simpler to make than a nuclear weapon. See discussion on radiological dispersal device (RDD) in the text.

**Dose rate meters:** Instruments that measure the radiation dose delivered per unit of time.

**Dose reconstruction:** A scientific study that estimates doses to people from releases of radioactivity or other pollutants. The reconstruction is done by determining how much material was released, how people came in contact with it, and the amount absorbed by their bodies.

**Dosimetry:** Assessment (by measurement or calculation) of radiation dose.

**Effective half-life:** The time required for the amount of a radionuclide deposited in a living organism to be diminished by 50% as a result of the combined action of radioactive decay and biologic elimination. See also biological half-life, radioactive half-life.
Exposure (irradiation): This occurs when radiation energy penetrates the body. Exposure to very large doses of radiation may cause death within a few days or months. Exposure to lower doses of radiation may lead to an increased risk of developing cancer or other adverse health effects later in life. Compare with contamination. For more information, see: http://emergency.cdc.gov/radiation/contamination.asp

Fallout, nuclear: The descent of radioactive debris from the atmosphere to ground level following a nuclear explosion. For more information, see: www.cdc.gov/nceh/radiation/fallout/RF-GWT_home.htm

Gamma rays: One of the primary ionizing radiations, the others being alpha particles, beta particles, x-rays, and neutrons. Gamma rays are highly penetrating (up to tens of yards in air) and pose an external radiation exposure hazard. Gamma rays also penetrate tissue farther than do beta or alpha particles. Gamma rays are relatively easy to detect with commonly available radiation detection instruments.

Geiger-Mueller (GM) survey meter: Also called Geiger counters, these survey meters are the most widely recognized and commonly used portable radiation detection instruments. The pancake GM detector can detect gamma, beta, and, to a limited extent, alpha contamination.

Genetic effects: Hereditary effects (mutations) that can be passed on through reproduction because of changes in sperm or ova. See also teratogenic effects, somatic effects.

Gray (Gy): A unit of measurement for absorbed dose. It measures the amount of energy absorbed in a material. The unit Gy can be used for any type of radiation, but it does not describe the biological effects of the different radiations. The conventional unit of absorbed dose is the rad. 1 Gy = 0.01 rad. For more information, see: http://emergency.cdc.gov/radiation/glossary.asp#primer

Half-life (radioactive): The time it takes for any amount of radioactive material to decay (and reduce) to half of its original amount. See also biological half-life, effective half-life, radioactive half-life.

Health physics: A scientific field that focuses on protection of humans and the environment from radiation. Health physics uses physics, biology, chemistry, statistics, and electronic instrumentation to help protect people from any potential hazards of radiation. For more information, see the Health Physics Society website: http://www.hps.org/

Health physicist: A specialist in radiation safety. See health physics.

Intake: Amount of radioactive material taken into the body by ingestion, inhalation, or absorption through the skin via wounds or injection.

Ionizing radiation: Any radiation capable of displacing electrons from atoms, thereby producing ions. High doses of ionizing radiation may produce severe skin or tissue damage.

Irradiation: Exposure to radiation. See exposure and compare with contamination.

Latent period: The time between exposure to a toxic material and the appearance of a resultant health effect.

Neutron: One of the primary forms of ionizing radiation, the others being alpha particles, beta particles, gamma rays, and x-rays. Neutrons are highly penetrating and are a radiation hazard in the time immediately following a nuclear detonation. In almost all other radiation emergency scenarios, encountering neutron radiation or contamination is unlikely. Detection of neutrons requires specialized equipment.

Non-stochastic effects: See deterministic effects.

Penetrating radiation: Radiation that can penetrate the skin and reach internal organs and tissues. Photons (gamma rays and x-rays), neutrons, and protons are penetrating radiations. However, alpha particles and all but extremely high-energy beta particles are not considered penetrating radiation.

Population monitoring: The process of identifying, screening, and monitoring people for exposure to radiation or contamination with radioactive materials.
Portal monitor: A portable doorway-like radiation detection system for monitoring people for radioactive contamination. The monitors look similar to metal detectors used in airport security screening stations. Certain types of portal monitors are used routinely to monitor vehicles or waste containers leaving hospitals or entering junk yards. When used to monitor people, they can be used in walk-through mode or by having each person stand in the monitor for a brief time period. The portal monitors do NOT produce radiation, and they can only measure gamma and high-energy beta radiation.

Plume: A cloud, gas, or vapor that carries radioactive material released into the atmosphere away from the incident site in the direction of the wind. Making plume concentration predictions with time after the incident is necessary to determine whether affected populations should shelter in place or evacuate. Plume predictions use mathematical models and, although very helpful, are prone to inherent uncertainties.

Prenatal radiation exposure: Radiation exposure to an embryo or fetus while it is still in utero (in its mother’s womb). At certain stages of the pregnancy, the fetus is particularly sensitive to radiation, and the health consequences could be severe above certain radiation dose levels. For more information, see: http://emergency.cdc.gov/radiation/prenatal.asp

Public monitoring: See population monitoring.

Rad (radiation absorbed dose): A unit of measurement for absorbed dose. It measures the amount of energy absorbed in a material. The unit rad can be used for any type of radiation, but it does not describe the biological effects of the different radiations. The international unit of absorbed dose is the gray (Gy). 1 rad = 0.01 Gy; 100 rad = 1 Gy. See absorbed dose. For more information, see: http://emergency.cdc.gov/radiation/glossary.asp#primer

Radiation: Energy moving in the form of particles or waves. Familiar radiations are heat, light, radio waves, and microwaves. Gamma rays (like x-rays) are ionizing radiation, a very high-energy form of electromagnetic radiation.

Radiation sickness: See acute radiation syndrome (ARS).

Radioactive contamination: See contamination.

Radioactive decay: See decay, radioactive.

Radioactive half-life: See half-life.

Radioactive material: Material that contains unstable (radioactive) atoms that give off radiation as they decay.

Radioactivity: The process of spontaneous transformation of the nucleus, generally with the emission of alpha or beta particles that are often accompanied by gamma rays. This process is referred to as decay or disintegration of an atom. See activity.

Radiobioassay: See bioassay.

Radiogenic: Health effects caused by exposure to ionizing radiation.

Radiological or radiologic: Related to radioactive materials or radiation. The radiological sciences focus on the measurement and effects of radiation.

Radionuclide: An unstable and therefore radioactive form of an element.

Rem: (roentgen equivalent man): A conventional unit for a derived quantity called radiation dose equivalent. This relates the absorbed dose in human tissue to the effective biological damage of the radiation. Not all radiation has the same biological effect, even for the same amount of absorbed dose. Dose equivalent is often expressed as thousandths of a rem, or millirem (mrem). The international unit for radiation dose equivalent is the sievert (Sv). 1 rem = 0.01 sieverts (Sv). For more information, see: http://emergency.cdc.gov/radiation/glossary.asp#primer
**Resuspension**: The physical process of making airborne radioactive contamination that otherwise would have remained deposited on the surface of objects. For example, wind blowing across a sidewalk will resuspend previously deposited contaminants, making them airborne in the breathing zone.

**Roentgen (R)**: A unit of exposure to x-rays or gamma rays.

**Shielding**: Material that can block or intercept radiation emanating from a radioactive source.

**Sievert (Sv)**: The international unit for a derived quantity called radiation dose equivalent. This relates the absorbed dose in human tissue to the effective biological damage of the radiation. Not all radiation has the same biological effect, even for the same amount of absorbed dose. Dose equivalent is often expressed as millionths of a sievert, or microsieverts (μSv). The conventional unit for radiation dose equivalent is the *rem*. 1 Sv = 100 rem. For more information, see: [http://emergency.cdc.gov/radiation/glossary.asp#primer](http://emergency.cdc.gov/radiation/glossary.asp#primer)

**SI units**: The Systeme Internationale (or International System) of units and measurements. This system of units officially came into being in October 1960 and has been adopted by nearly all countries, although the amount of actual usage varies considerably. For more information, see: [http://emergency.cdc.gov/radiation/glossary.asp#primer](http://emergency.cdc.gov/radiation/glossary.asp#primer)

**Somatic effects**: The health effects of radiation that are limited to the exposed person, as distinguished from genetic effects, which may also affect subsequent generations. See also *teratogenic effects*.

**Stochastic effects**: The health effects that occur on a random basis independent of the size of dose (e.g., cancer). The effects typically have no threshold and are based on probabilities, with the chances of seeing the effects increasing with dose. If they occur, the severity of stochastic effects is independent of the dose received. See also *deterministic effects*.

**Teratogenic effects**: Birth defects that are not passed on to future generations, caused by exposure to a toxin as a fetus. See also *genetic effects*, *somatic effects*.


See also, Radiation Dictionary (CDC) at: [https://emergency.cdc.gov/radiation/glossary.asp](https://emergency.cdc.gov/radiation/glossary.asp)
Appendix E
Guiding Principles in Planning for the Response to a Radiation Incident

1. The first priority is to save lives: respond to and treat the injured first. Treatment of life- or limb-threatening medical conditions should take precedence over decontamination. Standard Precautions are generally adequate to provide protection for first responders, emergency medical personnel, and clinicians.¹

2. Contamination with radioactive materials is not immediately life-threatening. Decontamination procedures are straightforward; removing clothing and washing the body thoroughly with mild soap and water will eliminate most external contamination.

3. Initial population monitoring activities should focus on preventing acute radiation health effects. Cross-contamination issues are a secondary concern, especially when the contaminated area or the affected population is large.²

4. Scalability and flexibility are important parts of the planning process. The criteria used for contamination screening and the radiation survey methods may have to be adjusted to accommodate the magnitude of the incident and availability of resources.

5. Fear of radiation is high, perhaps higher than with other agents of terrorism. Providing information and clear communication prior to and during an incident will help allay fears and allow people to make appropriate response decisions.

6. A key resource for implementing [radiological response/population monitoring] activities . . . . . is a state’s lead agency for radiation control [in Missouri, the Missouri Department of Health and Senior Service (DHSS)]. Additional expertise and resources to plan for and respond to a radiation incident can be obtained from radiation protection professionals in each community. Local emergency response plans should identify experts such as health physicists or radiation safety officers in area health departments, environmental agencies, hospitals, and universities. Relationships with these experts should be established in the planning stages.

7. First responders and local officials may not be aware initially that a radiation incident has occurred. Public health and emergency personnel’s initial response to an incident may be an all-hazards approach. However, once these personnel have determined that radiation or radioactive material is involved, they must begin addressing the issues related to this type of incident.

8. Radiological decontamination recommendations differ from those for chemical or biological agents. Decontamination for chemical or biological agents must be performed immediately. In a radiation emergency, people may be advised to self-decontaminate at home or at a community reception center. Decontamination should be done as soon as possible, but it usually does not require the same immediacy as chemical or biological contamination does.

9. Law enforcement agencies will be involved in response to a radiological terrorism incident. If a radiation incident is the result of a terrorist attack, the site will be considered a crime scene. Close coordination with local, state, tribal, and federal law enforcement agencies will be required to manage the public health response, because both public health and law enforcement personnel will need to conduct operations in the same area.³

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¹ Standard Precautions (previously known as Universal Precautions) are the minimum infection prevention practices that apply to all patient care, regardless of suspected or confirmed infection status of the patient, in any setting where health care is delivered. See CDC’s Guide to Infection Prevention for Outpatient Settings: Minimum Expectations for Safe Care, available at https://www.cdc.gov/HAI/settings/outpatient/outpatient-care-guidelines.html.

² Cross-contamination refers to spreading of radioactive materials from one person, object, or place to another.


Appendix F

FLOW CHART FOR RESPONDING TO A RADIOLOGICAL DISPERSAL DEVICE (RDD)

The following sections in this document are intended to detail the actions presented in the flow chart above and to provide examples, when applicable. Among the specific actions detailed in the flow chart are to:

- Establish incident command.
- Contact local/state radiation control program (contact numbers are provided in Appendix 9.)
- Control the scene and establish safe area if radiation is detected or suspected.
- Rescue injured.
- Start triage and rapid treatment.
- If feasible record contact information of uninjured victims at the scene.
- If life threatening, treat without regard for contamination and transport to hospital.
- If not life threatening but contaminated, decontaminate.
- For individuals not injured, test for contamination. If contaminated, decontaminate or release and issue procedure for home decontamination. Record contact information of uninjured victims at the scene.

Example of a Layout of Response Facilities/Locations Within Areas Established for a Radiological Emergency (IAEA/REMM)
Example of Patient Handling Flow in a Radiological Emergency (IAEA/REMM)
Appendix G
Providing Accurate, Timely Public Information During a Radiological Incident

The need for accurate and timely public information immediately after a dirty bomb detonation cannot be overemphasized. Health departments consistently rank as trusted sources for public information, so they will need to be prepared to help provide important public health information to the communities they serve. The public will likely be frightened and not easily directed or reassured. It will help if they have already received routine publications (fact sheets, brochures, etc.), giving them information about radiation and what to do following a radiological emergency. A strong public information campaign before and during an incident can help address uncertainty and minimize the potential for chaos. Further, because news and social media are key to efficiently and effectively distributing emergency public health messages, it is imperative that health departments work to build trust and credibility with local and regional media outlets before a major disaster strikes. These relationships will make working with the media in an emergency much easier.

During the response to a dirty bomb incident, public health officials will need to do a number of things simultaneously:

- Cooperate and collaborate closely with local and regional news and social media to distribute critical public health information to the community, including:
  - Provide pre-developed materials, such as fact sheets or brochures.
  - Conduct media briefings in coordination with other agencies.
  - Provide public health subject matter experts for media interviews.
- Monitor media reports closely in order to address inaccuracies or emerging issues.
- Set up rumor control hotlines, and provide training, scripts, or outlines for staff.
- Set up a dedicated event website, or update an existing one.
- Keep careful records of all official releases.
- Adjust the public information strategy as necessary.

Flexibility will be important, as media likely will be everywhere, and all department staff will need to be trained in the department’s media policies.

Your public information program should have two components:

- An ongoing, day-to-day component that informs people and establishes your credibility;
- An emergency response component that trades on that credibility to lead the public to take the actions most needed to protect themselves. There is a wealth of guidance on how to set up effective public information programs.

Find out what public information materials are already available (for example, see Section 2, above). Don’t reinvent wheels. If your jurisdiction already has some kind of fact sheet or brochure about bioterrorism, pandemic influenza, or other public health threats, consider expanding it to include radiological incidents – or at least pattern a radiological fact sheet after the existing one. People will feel more comfortable with established formats and will be able to find the information they need more quickly and easily.

Pre-script emergency messages. You won’t be able to predict and capture every aspect of an emergency and you may have to revise messages at the last minute, but it is much easier to revise a message during an emergency.
than to write a whole new one under pressure. Confer with your emergency management and radiological health experts; you may be able to use already existing messages as templates. If you don’t already have one, establish a policy regarding release of information and victim privacy rights – and make sure your staff are familiar with this policy.

In developing day-to-day and emergency public health messages and scripts, make sure to coordinate with the mental health provider community. Following a radiological incident, psychological effects will likely be pronounced and widespread. Skillful use of public information will not allay all fears, but can go a long way to reassure the public and minimize panic.

As with everything else in an emergency response, public information must be coordinated closely with other responder agencies. To accomplish this most effectively, your public information officer(s) will likely need to report to, or closely coordinate with, the event’s Incident Command Joint Information Center (JIC) along with other organizations’ public information officers. The overall response will be greatly helped by messages that supplement and reinforce—rather than contradict—each other.

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