Purpose: To provide guidance to practitioners caring for pediatric patients during a disaster

Disclaimer: This guideline are not meant to be all inclusive, replace an existing policy and procedure at a hospital or substitute for clinical judgment. These guidelines may be modified at the discretion of the healthcare provider.

Initial Management of All Pediatric Patients Involved in Radiological Event

- Determine if decontamination is needed due to external contamination (See below and pages 4 & 5 for information specific to decon)
- Stabilize ABCs (Airway, Breathing, Circulation)
- Immobilize spine as indicated
- Perform history and physical exam
- Look for other injuries (trauma)
- Keep patient NPO (including pacifiers)
- Follow your own hospital radiological response policy, if applicable.
- Consult Pediatric Care Medical Specialist for assistance with care of the acutely and critically ill patient, to individualize the care of patient, if patient does not improve and needs to be transferred and as needed for further support and consult.
- Contact the IEMA Communication Center (1-217-782-7860 OR 1-800-782-7860) to report that any type of radiologic event has occurred and/or report that patients arriving at the hospital have been involved in any type of radiologic incident.
- It is recommended that hospitals consult REAC/TS (Radiation Emergency Assistance Center/Training Site) for questions regarding additional care management information (24 hour emergency phone number: 865-576-1005)

Steps for Decontaminating Externally Contaminated Pediatric Patients

- Admit to controlled area
- Remove clothing (cut clothing in direction away from patient’s airway and roll it outward away from patient’s skin, trapping any material inside the clothes)
- Place all clothing in plastic bags for testing
- Assess for and stabilize any emergent medical issues
- Obtain medical/event history if patient or family able to provide
- Identify/contain contaminate
- Minimize any additional possible intake
- Follow IEMA, REAC/TS, and/or Department of Nuclear Safety recommendations
- See next page for general Information about Radiological Decontamination

Decontamination Order Priority:
1. Wounds
2. Body Orifices
3. Intact skin

Reassess all areas after decon

Contamination reduced to acceptable levels?
YES

NO

Begin medical treatment (see page 2)
Management for All Pediatric Patients Involved Radiological Event

Does patient have possible external irradiation or internally contaminated (see page 4 for definitions)?

- Evaluate using appropriate instrumentation (dosimeter) or history of event. Consult with hospital radiation safety officer for assistance and identifying available instrumentation, if available.

NO

Follow normal treatment procedures

YES

- If externally contaminated and patient is medically stable, follow decontamination procedures as indicated on previous page before beginning these recommended care guidelines.
- If externally contaminated and patient is medically unstable, stabilize prior to decon.
- Consult REAC/TS and Pediatric Care Medical Specialist for lab exams based on exposure and resources.
- Minimize uptake or facilitate excretion of contaminant through use of recommended medications and other techniques. (See next page for further management)
- Perform wound closures and any other surgical interventions within first 48 hours of irradiation (before wound healing and immunity is impaired)

Is there persistent vomiting, erythema and/or fever?

NO

- Observe for vomiting for 24 hours.
- If no vomiting, discharge home with medical and radiological specialist follow up.

YES

Admit patient. Consult with REAC/TS and Pediatric Care Medical Specialist to assist with determining need for admission, transfer or discharge.

Repeat CBC with differential every 4-6 hours for as long as REAC/TS recommends.

- Administer antiemetics
  - Ondansetron (Zofran):
    - >6 months-4 years: 0.15mg/kg IV/SQ/IO q4 hours
    - 4-11 years: 4mg SQ/PO q4 hours
    - >12 years: 8mg SQ/PO q12 hours
  - Granisetron (Kytril):
    - > 2 years: 10mcg/kg IV/IO over 5 minutes once a day OR 2mg PO once a day

REASSESS

Significant absolute lymphocyte decrease or other medical problems?

NO

Discharge home with appropriate medical and radiological specialist follow up.

YES

Continuous care:

- Medical evaluation and treatment (see next page)
- Continue to collect excretions as per REAC/TS recommendations
- Perform a dose assessment
- Consult REAC/TS and Pediatric Care Medical Specialist for lab exams based on exposure and resources for ongoing laboratory testing

Cytogenetics

Biodosimetry (gold standard for determining whole-body radiation dose. Contact REAC/TS for more information).
Medical Management (Continued)

Medical management is dependent upon the type of specific isotope and the amount of exposure so identifying agent as quickly as possible is important.

Several categories of medical management for internal contamination:
1. Reduction and/or inhibition of absorption of isotope in the GI tract
2. Blocking uptake to the organ of interest
3. Isotope dilution
4. Altering the chemistry of the substance
5. Displacing the isotope from receptors
6. Traditional chelation techniques
7. Early excision of radionuclides from wounds to minimize absorption
8. Bronchoalveolar lavage for severe cases of insoluble inhaled particles

Extensive information for medical management of patients with radiation exposure can be obtained by contacting REAC/TS or in The Medical Aspects of Radiation Incidents, which can be found on REAC/TS website at www.orise.orau.gov/reacts

Safety and effectiveness of many of the therapy recommendations have not been established in the pediatric patient. Contact Pediatric Care Medical Specialist and/or REAC/TS representative for treatment recommendations.

The following medications (potassium iodide and Prussian blue) can be obtained through the Strategic National Stockpile (SNS). Hospitals should follow their existing policy to request medications from the SNS. For questions or concerns regarding the policy to request medication from the SNS, hospitals can contact their local health departments, Regional Hospital Coordinating Center (RHCC) or the Pediatric Care Medical Specialist.

Potassium Iodide (KI)

Children are susceptible to thyroid cancer after being exposed to radioactive iodine. The uptake of radioactive iodine needs to be blocked by administering oral potassium iodide (KI) within 4 hours of exposure for exposures of ≥ 0.05 Gy (5 rad). See the dosing chart below.

<table>
<thead>
<tr>
<th>Age of Patient</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 month</td>
<td>16mg PO</td>
</tr>
<tr>
<td>1 month-3 years</td>
<td>32 mg PO</td>
</tr>
<tr>
<td>4-18 years</td>
<td>65 mg PO</td>
</tr>
<tr>
<td>Pregnant or lactating women</td>
<td>130 mg PO</td>
</tr>
</tbody>
</table>

Protective effects of KI lasts approximately 24 hours and is usually given once. If child is unable to be evacuated to a safer area within 24 hours, contact Pediatric Care Medical Specialist for the possible need for repeat doses.

If liquid form is not available, below are the steps for how to convert the KI tabs to KI solution:
1. Place one 130mg tablet (or two 65mg tablets) into a bowl and grind into a fine powder.
2. Add 20ml of water to bowl and dissolve the KI powder.
3. Add 20ml of milk, juice, soda or syrup to flavor the KI/water mixture
4. Resulting solution has a concentration of 16.26mg/5ml
5. Unused iodine mixture may be stored in the refrigerator for up to 7 days.

Other considerations:
- Need to monitor a newborn’s thyroid function 2-3 weeks after receiving KI because KI can cause a transient decrease in thyroxin and increase in the TSH level
- Breastfeeding:
  - The Food and Drug Administration (FDA) and American Academy of Pediatrics (AAP) have each released recommendations for breastfeeding after a mother has been exposed to radiation. The FDA’s recommendation is a mother can breast feed after she has been treated with KI. The AAP recommends that mothers do not breast feed, even if they have been treated with KI unless no other alternative is available. For more information or assistance with determining if breast feeding should continue, consult the Pediatric Care Medical Specialist and/or REAC/TS.
**Prussian Blue**

Prussian Blue is utilized when the source is cesium, rubidium or thallium. The dosing recommendations are:
- Children 2-12 years old: 1 gm PO TID
- Children >13 years old: 3 gm PO TID

---

**Approximate Thresholds for Acute Radiation Syndromes**

<table>
<thead>
<tr>
<th>Dose</th>
<th>Syndrome</th>
<th>Signs/Symptoms*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-100 rads</td>
<td>NA</td>
<td>Generally asymptomatic, potential slight drop in lymphocytes later (near 1 Gy)</td>
</tr>
<tr>
<td>(0-1 Gy)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 100 rads</td>
<td>Hematopoietic</td>
<td>Anorexia, nausea, vomiting, initial granulocytosis and lymphocytopenia.</td>
</tr>
<tr>
<td>(&gt; 1 Gy)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 6-800 rads</td>
<td>Gastrointestinal</td>
<td>Early severe nausea, vomiting, watery diarrhea, pancytopenia</td>
</tr>
<tr>
<td>(&gt; 6-8 Gy)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 2000 rads</td>
<td>Cardiovascular/ CNS</td>
<td>Nausea/vomiting within first hour, prostration, ataxia, confusion</td>
</tr>
<tr>
<td>(&gt; 20 Gy)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* At higher doses the time to onset of signs/symptoms may be compressed.

---

**Psychological Considerations**

Radiation emergencies, whether it be from a leak at a nuclear power plant or from a terrorist type incident such as a dirty bomb, leads to significant public anxiety. The anxiety associated with such events can appear out of proportion to the radiation induced health effects and can greatly affect the entire community. Many patients may present with symptoms such as nausea. It is important for providers to determine if nausea is from contamination or from the anxiety of the event. Long term psychological effects can manifest years after an event. General examples of long term effects include: feelings of vulnerability, PTSD, chronic anxiety, feelings of loss of control, fear of safety and health of themselves as well as future generations, and multiple idiopathic physical symptoms (MIPS). Provide educational materials and counseling options to all patients and their families after a radiological emergency.

---

**Radioactive Contamination versus Exposure**

- **Radioactive contamination**: radioactive material is on or inside a person
  - External contamination: radioactive material is only on outside of a person
  - Internal contamination: radioactive material is ingested, inhaled, or absorbed through the skin or open wound
- **Radiation exposure**: a person is exposed to radioactive materials
- **Difference between contamination and exposure**:
  - Person exposed to radiation may not be contaminated. An radiation exposure means radioactive material penetrated the person’s body. For a person to be contaminated with radioactive materials, the materials must be on or inside of the person’s body.
General Information about Radiological Decontamination

- Typically is not emergently needed as compared to chemical decon
  - *Can begin treatment for life threatening conditions before initiating decon*
  - Low risk to health care providers if decon is delayed
- Radioactive material cannot be neutralized, only moved from one point to another
- Clean dry sheet or drapes should be applied to the area to prevent spread of contamination to uncontaminated areas
- Standard pediatric considerations for decontamination apply:
  - Use warm water (98°-110°F)
  - Do not carry infants/young children through decon shower
  - Have rewarming measures available after decon is completed
- Clean wound via baby wipes or via irrigation
  - Options: baby wipes, irrigation, OR soft cloth with soap and tepid water
- Irrigation:
  - Irrigate wound/orifice/area with sterile saline or equivalent
  - Prevent splashing
- Run-off should be directed into a receptacle (i.e. lined garbage can)
  - Keep all waste (run-off, absorbent pads, sheets, towels) for later collection and disposal
- Repeat until no further contamination is noted.
- Minor debridement may be needed if wound has foreign bodies in it
- After decon completed, clean wound as per hospital protocol.
- Other considerations:
  - Partial thickness burns:
    - Always irrigate
    - Leave blisters closed
    - Irrigate open blisters
  - Full thickness burns:
    - Radioactive contaminate will slough in eschar
    - Contaminates will remain in layers of dead tissue