Cautions

- Orders must be customized for each event and patient!
- Specific drugs are suggested for function only, and patients may not need any/every category of drug listed. Consult the notes at the end of this document.
- This Adult Orders Prototype lists only FDA-approved medications as radioisotope countermeasures for internal contamination; see page 9-10. These drugs are currently in the Strategic National Stockpile. Prescribers should consult the FDA drug label for complete information.
- All dosages in this prototype are based on a 70 kg adult with normal renal and hepatic function. Appropriate dosage adjustments should be made based on age, weight, drug-drug interactions, nutritional status, renal and hepatic function. Pediatric doses are not referenced, except for Potassium Iodide.
- This Adult Orders Prototype does not address threshold levels of internal contamination that would trigger initiation, continuation, or discontinuation of decorporation treatment. See REMM Countermeasures Caution and Comment information that discusses this issue.
- After a mass casualty event, practitioners may encounter counterfeit drugs. This FDA website will provide information on avoiding and detecting counterfeit drugs and assist reporting of suspected counterfeit medications.
- See “Notes” at end of order list for additional information.
1. Administrative information

Name: __________________________________
Unique Identifier: ________
Address: __________________________________
Phone: _______________
Spoken language: _____

Admit to:

__ Hospital ward ____________  __ Area ____________

__ Team: ____________  __ ICU ____________

__ Physician: ____________  __ Other ____________

Next of kin contact information: __________________________________________

Special needs: __________________________________________________________

2. Diagnoses: Radiation, Other

__ Radiation contamination: description

· See REMM Body Chart (page 14) to record whole body radiation survey.

__ External contamination with Isotope (Specify) ____________

__ Internal contamination with Isotope (Specify) ____________

__ Contamination suspected, Isotope uncertain

__ Radiation Exposure / Acute Radiation Syndrome (ARS)

__ Date of exposure ____________

__ Time of exposure ____________

__ Location of patient at time of exposure ____________

__ Estimated whole body/partial body dose, specify ________ (dose)

__ Dose unknown

· See REMM information on Dose Reconstruction.

__ Other potential complicating factors

__ Combined injuries? e.g. burn, blast, fracture, other
          Specify: __________________________________________

__ Mass casualty incident
Specific populations potentially requiring more customized management

See REMM At-Risk/Special Needs Populations page

- Young age (e.g. children < 12-16 y)
- Older age (e.g., those > 65 y)
- Pregnant/Possibly pregnant
- Immunosuppressed

History of prior significant chronic disease(s) or conditions.
Specify each, including meds or special needs required for each:

_ _______________________________________________________________________
_ _______________________________________________________________________
_ _______________________________________________________________________
_ _______________________________________________________________________

Precautions
- Contact
- Droplet
- Airborne
- External Radiation
- Internal Radiation
- Reverse/Neutropenic

Urgent Consultations as indicted:

- Hematopoietic Stem Cell Transplantation
- Radiation Oncology
- Hematology / Oncology
- Transfusion Medicine
- Mental Health / Psychiatry
- Endocrinology
- Ophthalmology
- Pain Service
- Dermatology / Plastic Surgery
- Gastroenterology
- Radiation Safety
- Burn Therapy

3. Condition:

- Good
- Fair
- Stable
- Guarded
- Critical

4. Vital Signs:

- q 2 hours X 4
- q 4 hours X 4
- Ward routine

Notify physician for:
5. Special orders for patients with known or possible radiation contamination:

- Radiation precautions
  - Universal precautions with gown, mask, cap, boots, and gloves
  - Use medical facility procedures for discarding biological/physical/radioactive waste, including linens/towels/trash/personal protective equipment.
  - Contact Radiation Safety Officer for additional instructions.
  - Place radiation safety sign on door if patient has internal or external radioactive contamination.
  - Notify pregnant staff that entry to room is prohibited if patient is/may be contaminated.
  - Everyone entering room/area of contaminated patient must wear personal radiation dosimeter.

6. Allergies:

- No Known Drug Allergies (NKDA)
- Allergies (drugs, foods)

If yes, specify: __________________________________________________________

7. Activity:

- Bed rest
- Bathroom privileges
- Out of bed every ___ hrs.
- Ambulate as tolerated

8. Diet:

- Regular Diet
- Liquids (full, clear)
- NPO
- Advance as tolerated
- Neutropenic diet
- Other ________
- Special dietary needs/requests ________________________________

9. Height, weight, age:

- Height: ____ feet ____ inches
- Weight: ____ lbs ____ oz
- ____ cm
- ____ kg
Age: _____ years

Repeat body weight:
q _____ hours
q _____ days

10. Peripheral IV management:
   __ IV Fluids: ______ @ _____ cc/hr, with additive ______
   __ IV Fluids: ______ @ _____ cc/hr, with additive ______

11. __ Foley catheter management
   Use radiation precautions for urine and feces for patients with internal radiation contamination.

12. __ Monitor I / O
   Frequency ____________
   Use radiation precautions for urine and feces for patients with internal radiation contamination.

13. Deep Venous Thrombosis (DVT) prophylaxis1:
   __ TED hose to Bilateral Lower-Extremities
   __ Sequential Compression Devices (SCD)
   __ Anticoagulation regimen ____________________________
   __ Other
   The potential benefit of anticoagulation (e.g. heparin1,2) should be balanced against the risk of excessive bleeding in patients with severe thrombocytopenia or significant gastrointestinal toxicity.

14. Respiratory Therapy: (Radiation precautions needed if patient is contaminated.)
   __ Room air    __ Chest tube care (Specify) ____________
   __ Titrate oxygen supplementation for Oxygen saturation > ____%
   __ Nebulizer treatment (Specify) ____________________________

15. Wound care1: (see also item 22: burn therapy)
   __ Decontaminate external wounds if there is external contamination.
      See REMM contaminated wound care recommendations.
   __ Sterile dressing to wounds daily
Monitor waste: Use medical facility procedures for discarding biological/radioactive/physical waste and linens/towels/trash/personal protective equipment. Radiation precautions needed if patient is contaminated.

Silvadene (Silver Sulfadiazine)² cream topically to burns

Other wound management per Burn team/Dermatology/Surgery:
Pager ____________  Phone ________________________

16. Orthopedic care:

__ Splint/brace/cast

__ Other orthopedic management procedure per orthopedics:
Pager ____________  Phone ________________________

17. Admission labs / imaging studies / other:

__ CBC w/differential

__ Comprehensive Metabolic Panel (CMP) / Chem 14

__ Cardiac enzymes

__ PT / PTT

__ Urinalysis

__ Urine culture

__ Blood culture x 2

__ Urine HCG

__ Serum HCG

__ Thyroid Function Tests (Specify) _____________

__ Serologies:
  __ Herpes Simplex Virus type 1 (HSV-1)
  __ Herpes Simplex Virus type 2 (HSV-2)
  __ Cytomegalovirus (CMV)
  __ Varicella-zoster virus (VZV)

__ Electrocardiogram

__ Chest x-ray ______ PA/Lat _________ Portable

__ Other imaging studies  Specify:______________________________

18. Standing labs / studies:
__ CBC w/diff q ___ hours, x ___ days, Followed by q ____ until further orders

__ Comprehensive Metabolic Panel (CMP) / Chem 14 Followed by q ____ hours, x ____ days Followed by q ____ until further orders

19. Electrocardiogram

__ Electrocardiogram
__ STAT Electrocardiogram for chest pain, notify physician


For biodosimetry: See REMM for more on the Dicentric chromosome assay.

__ Dicentric Chromosome Assay: Draw extra green top tube on: date ________ time ________ Send this tube ON ICE for outside lab study To the Attention of: __________________________________ Name of Lab: ___________________________________________ Address of Lab: __________________________________________ See REMM for location of laboratories that perform this test.

For Bioassay: tests evaluating/managing internal decontamination:

__ Spot urine for ______ name of radioactive isotope
__ 24-hour urine for ______ name of radioactive isotope
__ Spot fecal specimen for ______ name of radioactive isotope
__ 24-hour fecal specimen for ______ name of radioactive isotope

Send specimen to: _________________________________

Special requirements for containment, labeling, and shipping of specimen: _________________________________

Note: Consult senior radiation event medical managers for name and location of specialized laboratories if your facility cannot perform these assays.

21. __ Type and cross match

__ Type and screen

For ____ units of packed red blood cells
For ____ units of platelets

• Use only leukoreduced AND irradiated products, if available, unless
it is known with certainty that the patient was exposed to a low dose of radiation, e.g. less than 100 cGy.

- If dose is not known with certainty, leukoreduced AND irradiated products are preferred, if available.
- See REMM blood use page for additional information.

22. General Medications:

For gastric acid suppression:

- Lansoprazole (Prevacid) 15-30 mg PO daily

For radiation-induced nausea & vomiting:

- Ondansetron (Zofran) 4 mg IV q 8h PRN nausea/emesis
- Lorazepam (Ativan) 0.5 mg – 1 mg PO q 6-8h PRN anxiety/insomnia/breakthrough nausea
- Prochlorperazine (Compazine) 10 mg PO/IM/IV q 6-8h PRN anxiety/insomnia/breakthrough nausea

- See American Society of Clinical Oncology 2006 Anti-emetic Guidelines
- See NEJM June 5, 2008 article: chemotherapy induced nausea and vomiting

For Fever:

- Acetaminophen (Tylenol) 650 mg PO q 6 – 8h PRN temperature > 38 ºC

For diarrhea:

- Loperamide hydrochloride (Imodium): Recommended initial dose is 4 mg (2 capsules) followed by 2 mg (1 capsule) after each unformed stool.
  - Daily dose should not exceed 16 mg (8 capsules)

For constipation:

- Senna (Senokot) 2 tabs PO BID, hold for loose stools
- Docusate (Colace) 100 mg PO BID, hold for loose stools.
  - Per FDA monograph: 50 to 360 mg QD or divided BID for adults

For rash:

- Topical sterile dressing
- Diphenhydramine hydrochloride (Benadryl) 25-50 mg PO q 4-6 hours for pruritis, not to exceed 300 mg/24 hours

For pain:
Morphine sulphate\(^2\) ____ mg ____ route ____ frequency

For skin burns: (see also item 15: wound care)

Burn topical regimen

Replace body fluid

Other burn therapy

For oral mucositis:

Mouth care regimen

---

### 23. For radioisotope decorporation or blocking:

- **Note:** Only FDA approved radiation countermeasures are listed in table below.
- See [REMM Radiation Countermeasures for Treatment of Internal Contamination](https://remm.nlm.nih.gov) table for longer list of countermeasures which have been recommended by some experts but are not FDA approved as radiation countermeasures.

<table>
<thead>
<tr>
<th>Medical Countermeasure</th>
<th>Administered for</th>
<th>Route of Administration</th>
<th>Dosage</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ca-DTPA(^2,4)</td>
<td>Americium (Am-241)(^2)</td>
<td>IV(^2): Give once daily as a bolus or as a single infusion, i.e., do not fractionate the dose. DTPA is FDA-approved for intravenous Rx of known or suspected internal contamination with Am, Cm, and Pu only.</td>
<td>IV: 1 g in 5 cc 5% dextrose in water (D5W) or 0.9% sodium chloride (normal saline, NS) slow IV push over 3-4 minutes</td>
<td>• Ca-DTPA for the first dose • Give Zn-DTPA for any follow-up doses (i.e., maintenance as indicated) • Duration of therapy depends on total body burden and response to treatment</td>
</tr>
<tr>
<td>Zn-DTPA(^2,4)</td>
<td>Californium (Cf—252)(^3)</td>
<td>OR</td>
<td>Nebulized inhalation(^2): DTPA is FDA-approved for nebulized inhalation in adults only, and if the route of contamination is through inhalation.</td>
<td>Nebulized inhalation: 1 g in 1:1 dilution with sterile water or NS over 15-20 min</td>
</tr>
<tr>
<td></td>
<td>Cobalt (Co-60)(^3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Curium (Cm-244)(^2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plutonium (Pu-238 and Pu-239)(^2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yttrium (Y-90)(^3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>See REMM’s DTPA information.</td>
<td>See FDA’s Zn-DTPA drug label.</td>
<td>See FDA’s Ca-DTPA drug label.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical Countermeasure</td>
<td>Administered for</td>
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</tr>
<tr>
<td>------------------------</td>
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<td>---------</td>
</tr>
</tbody>
</table>
| Potassium iodide^2     | Iodine (I-131)   | PO                      | Adults >40 years: 130 mg/day (for projected thyroid dose ≥ 500 cGy)  
Adults 18-40 years: 130 mg/day (for projected thyroid dose ≥ 10 cGy)  
Pregnant or lactating women of any age: 130 mg/day (for projected thyroid dose ≥ 5 cGy) | Some incident will require only a single dose of KI.  
Incident managers may recommend additional doses if ongoing radioactive iodine ingestion or inhalation represents a continuing threat.  
See also: Potassium Iodide (KI): Duration of Therapy. |
|                        |                  |                         |        |         |
|                        | Prussian blue, insoluble^2 | Cesium (Cs-137)  
Thallium (TI-201) | 3 g PO tid (see FDA package insert)  
OR  
1 - 3 g PO tid with 100-200 mL water, up to 10-12 g/day (based on Goiânia accident data) | Minimum 30 days course per FDA  
Obtain bioassay and whole body counting to assess treatment of efficacy  
Duration of therapy depends on total body burden and response to treatment |
24. Neutropenia therapy, if indicated\(^1, 5\):

- Although the 3 drugs listed below are FDA-approved for the treatment of chemotherapy induced neutropenia, none is approved either for radiation-induced neutropenia or as prophylactic treatment prior to the onset of neutropenia.
- See additional REMM information on [white cell growth factors/cytokines](#).
- In a mass casualty radiation event, use of these drugs would be off-label or require a formal [Emergency Use Authorization](#).

<table>
<thead>
<tr>
<th>Cytokine(^3)</th>
<th>Adult dose</th>
<th>Pregnant Women(^6)</th>
</tr>
</thead>
</table>
| **G-CSF or filgrastim\(^3\) (Neupogen)** | • Subcutaneous administration  
• 5 ug/kg/day via single daily injection  
• Continue until absolute neutrophil count > 1.0 \(\times\) 10\(^9\) cells/L | Class C\(^6\)  
(Same as adults) |
| **Pegylated G-CSF or pegfilgrastim\(^3\) (Neulasta)** | • 1 subcutaneous dose, 6 mg  
• Consider second 6 mg dose 7 or more days after initial dose, if significant neutropenia persists | Class C\(^6\)  
(Same as adults) |
| **GM-CSF or sargramostim\(^3\) (Leukine)** | • Subcutaneous administration  
• 250 ug/m\(^2\)/day  
• Continue until absolute neutrophil count > 1.0 \(\times\) 10\(^9\) cells/L | Class C\(^6\)  
(Same as adults) |

See Practice Guidelines for myeloid growth factors
- [National Comprehensive Cancer Network](#)
- [American Society of Clinical Oncology](#)

**Antimicrobial prophylaxis\(^1\):**

- Use as appropriate for each patient.
- Drugs listed are examples only.

**Anti-bacterial prophylaxis**

- **Levofloxacin (Levaquin)**\(^2\) 500 mg PO/IV qd

**Anti-viral prophylaxis**

- **Acyclovir (Zovirax)**\(^2\) 400 mg PO q12h, or
- **Acyclovir (Zovirax)**\(^2\) 250 mg/m\(^2\) IV q12h

**Anti-fungal prophylaxis**

- **Fluconazole (Diflucan)**\(^2\) 400 mg PO/IV daily – beginning when absolute neutrophil Count (ANC) becomes < 1000, or
- **Posaconazole (Noxafil)**\(^2\) 200 mg PO tid with food – beginning when absolute Neutrophil Count (ANC) becomes < 1000

25. Fever and Neutropenia\(^1\)
__ Blood cultures x 2 sets  __ Urinalysis w/culture
__ Sputum culture + sensitivity  __ Chest x-ray
__ Cefepime (Maxipime)\(^2\) 2 gm IV q 8h
__ Vancomycin (Vancocin)\(^3\) 1gm IV q 12h, consider trough level before 4th dose

See current Fever and Neutropenia Guidelines from
  - IDSA  Infectious Diseases Society of America
  - ASCO  American Society of Clinical Oncology

Antifungal therapy (consider one of the following\(^1\)):

__ Liposomal amphotericin B (Ambisome)\(^2\) 3mg/kg/day IV over 1-4h
__ Amphotericin B lipid complex (Abelcet)\(^2\) 3mg/kg/day IV over 1-4h
__ Voriconazole (Vfend)\(^3\) 6mg/kg IV q 12h for two doses, then 4mg/kg IV q 12h
__ Caspofungin (Cancidas)\(^2\) 70mg IV once then 50mg IV q 24h

NOTES

1. Suggested drugs are listed as representatives of a functional class, and no specific medication endorsement is implied. Dosages are based on a 70 kg adult with normal baseline renal and hepatic function. Appropriate dosage adjustments should be made based on age, weight, drug-drug interactions, nutritional status, renal and hepatic function, and any other patient-specific characteristics that may apply.

2. FDA approved for this indication

3. This drug is not approved by the FDA for this indication. If used, this would be an “off label use”, and physician discretion is strongly advised.

4. Ca-DTPA and Zn-DTPA have not been approved by FDA for treating internal contamination with californium, thorium, and yttrium. For initial treatment, Ca-DTPA is recommended, if available, within the first 24 hours after internal contamination. Zn-DTPA is preferred for maintenance after the first 24 hours, if available, due to safety concerns associated with prolonged use of Ca-DTPA.

5. When to initiate treatment with cytokines
   - Initiation of treatment should be strongly considered for victims who develop an absolute neutrophil count of < 0.500 x 10\(^9\) cells/L and are not already receiving colony-stimulating factor.
   - Evidence from animal studies indicates that outcomes may be improved if colony stimulating factors are administered as soon as possible after radiation exposure, and prior to the onset of neutropenia.
   - Although most therapy for ARS is directed at actual clinical signs and symptoms, some clinical effects of ARS can be anticipated and potentially
mitigated, as with the use of prophylactic white cell cytokines. This prophylactic use is also off label.

- Emergency Use Authorization will be required for use of cytokines for radiation induced neutropenia in a mass casualty setting.
- See published guidelines links in section 24.

6. For pregnant women:
   - Experts in biodosimetry must be consulted.
   - Any pregnant patient with exposure to radiation should be evaluated by a health physicist and maternal-fetal specialist for an assessment of risk to the fetus.
   - Class C refers to U.S. Food and Drug Administration Pregnancy Category C, which indicates that studies have shown animal, teratogenic, or embryocidal effects, but there are no adequate controlled studies in women; or no studies are available in animals or pregnant women.
Body Chart for Recording Results of Radiation Survey