

Prototype for Adult Medical Facility Orders During a Radiation Event
Version 9/23/2011

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

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___ 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:

- | | |
|--|---|
| <input type="checkbox"/> Hematopoietic Stem Cell Transplantation | <input type="checkbox"/> Radiation Oncology |
| <input type="checkbox"/> Hematology / Oncology | <input type="checkbox"/> Transfusion Medicine |
| <input type="checkbox"/> Mental Health / Psychiatry | <input type="checkbox"/> Endocrinology |
| <input type="checkbox"/> Ophthalmology | <input type="checkbox"/> Pain Service |
| <input type="checkbox"/> Dermatology / Plastic Surgery | <input type="checkbox"/> Gastroenterology |
| <input type="checkbox"/> Radiation Safety | <input type="checkbox"/> 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:

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- Temperature > 38.5 °C
- SBP > 180, < 100
- DBP > 100 < 50
- HR > 100 < 50
- RR > 30 < 8
- O₂ saturation < 92%

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.
 phone: _____ page: _____
- 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
 _____ cm

Weight: _____ lbs _____ oz
 _____ kg

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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. **heparin**^{1,2}) 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

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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:

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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

20. Biodosimetry/Bioassay tests: See REMM's [Explaining Biodosimetry](#).

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

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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 Medications¹:

For gastric acid suppression:

___ **Lansoprazole ([Prevacid](#))²** 15-30 mg PO daily

For radiation-induced nausea & vomiting:

___ **Ondansetron ([Zofran](#))²** 4 mg IV q 8h PRN nausea/emesis

___ **Lorazepam ([Ativan](#))²** 0.5 mg – 1 mg PO q 6-8h PRN anxiety/insomnia/breakthrough nausea

___ **Prochlorperazine ([Compazine](#))²** 10 mg PO/IM/IV q 6-8h PRN anxiety/insomnia/breakthrough nausea

- See [American Society of Clinical Oncology 2006 Anti-emetic Guidelines³](#)
- See NEJM June 5, 2008 article: [chemotherapy induced nausea and vomiting³](#)

For Fever:

___ **[Acetaminophen \(Tylenol\)](#)²** 650 mg PO q 6 – 8h PRN temperature > 38 °C

For diarrhea:

___ **Loperamide hydrochloride ([Imodium](#))²:**

- 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** 2 tabs PO BID, hold for loose stools

___ **Docosate ([Colace](#))²** 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](#))²** 25-50 mg PO q 4-6 hours for pruritis, not to exceed 300 mg/24 hours

For pain:

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__ **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](#) table for longer list of countermeasures which have been recommended by some experts but are not FDA approved as radiation countermeasures.**

Medical Countermeasure	Administered for	Route of Administration	Dosage	Duration
Ca-DTPA ^{2,4} Zn-DTPA ^{2,4} See REMM's DTPA information. See FDA's Zn-DTPA drug label. See FDA's Ca-DTPA drug label.	Americium (Am-241) ² Californium (Cf-252) ³ Cobalt (Co-60) ³ Curium (Cm-244) ² Plutonium (Pu-238 and Pu-239) ² Yttrium (Y-90) ³	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. Nebulized inhalation ² : DTPA is FDA-approved for nebulized inhalation in adults only, and if the route of contamination is through inhalation.	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 OR 1 g in 100-250 cc D5W or NS as an infusion over 30 minutes Nebulized inhalation : 1 g in 1:1 dilution with sterile water or NS over 15-20 min	<ul style="list-style-type: none"> • 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

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Medical Countermeasure	Administered for	Route of Administration	Dosage	Duration
Potassium iodide² See REMM's KI summary information. See FDA's KI information.	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)	<ul style="list-style-type: none"> 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, insoluble² See REMM's Prussian Blue summary information. See FDA's Prussian Blue drug label.	Cesium (Cs-137) Thallium (TI-201)	PO	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)	<ul style="list-style-type: none"> 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

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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](#).

Cytokine³	Adult dose	Pregnant Women⁶
G-CSF or filgrastim ³ (Neupogen)	<ul style="list-style-type: none"> • Subcutaneous administration • 5 ug/kg/day via single daily injection • Continue until absolute neutrophil count > 1.0 x 10⁹ cells/L 	Class C ⁶ (Same as adults)
Pegylated G-CSF or pegfilgrastim ³ (Neulasta)	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • Subcutaneous administration • 250 ug/m²/day • Continue until absolute neutrophil count > 1.0 x 10⁹ 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 prophylaxis¹:

- 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/m² 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 Neutropenia¹

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- | | |
|--|--------------------------|
| ___ 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 following¹):

- ___ 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 $< 0.500 \times 10^9$ 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**

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- 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

