



Cautions

- Authored by [REMM](#) and [RITN](#) physicians, this set of orders is a prototype only.
- **Orders must be customized for each patient and incident.**
- Specific drugs are suggested for function only. Patients may not need any/every category of drug listed.
- No HHS, CDC, FDA, or other US government entity endorsement of specific drugs or drug doses is intended or implied by inclusion in this order set.
- Consult the notes at the end of this document for additional, key information.

Internal contamination (decorporation treatments)

- This **Pediatric Orders Prototype** lists only FDA-approved medications as radioisotope countermeasures.
- Some, but not all of these drugs are currently in the [Strategic National Stockpile](#).
- Prescribers should consult the FDA drug label for complete prescribing information.
- Decorporation drugs should be used in children and pregnant women with great caution.
- The online version of REMM has additional recommendations about [additional countermeasure drugs that may be considered](#).
- This 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](#), which discusses this issue.

Drug dosages

- All drug doses in this prototype should be customized for each patient.
- All pediatric drug doses should be prescribed as appropriate for **age, weight**, and any **clinical issues**, including allergies.
- Appropriate dose adjustments should be made based on age, weight, drug-drug interactions, nutritional status, renal, hepatic function, and risk/benefit calculus.

Mass Casualty Emergency

- After a mass casualty incident, practitioners may encounter counterfeit drugs. This [FDA website](#) will provide information on avoiding and detecting counterfeit drugs and assist with reporting of suspected counterfeit medications.
- **Version date is noted in the header.** Before using an order set that has been previously printed for use offline, consult the online version of REMM to see if updates are available.

This REMM web page has the most recent version of both the adult and pediatric templates.

<https://remm.hhs.gov/adultorderform.htm>

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REMM Prototype / Template for Pediatric Hospital Orders During a Radiation Emergency (Version: 06FEB2025)



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1. Administrative information

Name: _____

Unique Identifier: _____

Address: _____

Phone: _____

Spoken language: _____

Date of Birth: _____

Age Months (if <3 years) _____ Years _____

Height (cm)/ _____ Weight (Kg) _____

Gender: _____

Dietary Special needs: _____

Default Guarantor: _____

Relationship: ___ Father ___ Mother ___ Other: specify _____

Next of kin and contact information (home phone, cell phone, email, or address):

Primary Care Provider: _____

2. Allergies:

No Known Drug Allergies (NKDA)

Allergies (drugs, foods)

If yes, specify drug/food and reaction: _____

3. Patient Symptoms:

Fever (Yes/No) When began: _____

Nausea (Yes/No) When began: _____

Vomiting (Yes/No) When began: _____

Diarrhea (Yes/No) When began: _____

Other (describe): _____

4. Emergency care previously provided:

Did the patient receive any care related to this incident prior to admission (Yes/No):

Describe: _____

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Did the patient receive any medications as part of this care (Yes/No):

Describe: _____

Specifically did the patient receive cytokines (Yes/No):

What was given and when (if known): _____

5. Initial Evaluation:

Vital Signs:

BP _____ Pulse _____ Temp _____ Oxygen _____

Height _____ cm Weight _____ kg

Initiate sepsis workup for the following conditions:

Age	HR (95 th %ile)	HR (75 th %ile)	Systolic BP (5 th %ile)
0 d - ≤ 1 m	>205	>155	<60
> 1 m – ≤ 3 m	>205	>155	<70
> 3 m – ≤ 1 y	>190	>140	<70
> 1 y – ≤ 2 y	>190	>130	<70 + (age in yr x 2)
> 2 y – ≤ 10 y	>140	>110	<70 + (age in yr x 2)
>10 y	>100	>100	<90

Pediatric SIRS Criteria (Systemic Inflammatory Response Syndrome)

Modified SIRS Criteria: must have 2 of 4 criteria, 1 must be temperature or leukocyte abnormality

- Temperature (core) <36 °C or >38.5 °C
- Fever > 38°C x2 over one hour apart in presence of neutropenia
- Tachycardia: HR > 2 SD above normal for age or bradycardia if < 1 year old
- Respiratory: Mean RR >2 SD above normal for age or mechanical ventilation required for an acute process
- Elevated or depressed WBC for age (unrelated to chemotherapy induced leukopenia) or >10% immature neutrophils

Patient Condition Assessment:

___ Good ___ Fair ___ Stable ___ Guarded ___ Critical

Abnormal Physical Findings:



6. Admission studies labs:

- CBC w/differential _____ w/ Retics count
- Comprehensive Metabolic Panel (CMP) / Chem 14
- PT or INR/PTT/fibrinogen/TT
- Urinalysis - Collection method: _____
- Urine culture
- Blood culture - Collection method: _____ Sets: _____
Type of culture: Bacteria, fungal, aerobic, anaerobic
- Wound cultures
- Sputum culture
- Nasal and rectal swabs (for colonization in burn patients)
- Urine HCG (for all girls ≥ 10 years or post-menarche, whichever is earlier)
- Serum HCG (for any girls ≥ 10 years or post-menarche, whichever is earlier)
- Thyroid Function Tests (Specify) _____
 - TSH
 - Free T4
- See blood bank labs section, including Type & Screen or Cross Match
- Other Labs: _____

Serologies:

- Cytomegalovirus (CMV)
- Varicella-zoster Virus (VZV)
- Epstein Barr Virus (EBV)

7. Blood bank

(May set institutional transfusion parameters, e.g.: PRBC transfusion for Hgb < 7 g/dl and PLT < 10000/microL unless otherwise specified by medical staff.)

- Type and cross match
- Type and screen

For _____ units or _____ ml of packed red blood cells (~10-15 ml/kg)
 For _____ units or _____ ml of platelets (~5-10 ml/kg)

Note:

- Use only leukoreduced AND irradiated products, if available, unless it is known **with certainty** that the patient was exposed to **whole body dose of radiation than 100 cGy.**

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- If radiation whole body dose is **not known** with certainty, leukoreduced AND irradiated products are preferred, if available.
- See [REMM blood use page](#) for additional information

8. Chest X-Ray/Imaging:

- PA/Lateral Urgency: _____
- Portable Urgency: _____
- Other imaging studies Specify: _____ Urgency: _____
- Other imaging studies Specify: _____ Urgency: _____

9. Electrocardiogram:

- Electrocardiogram
- STAT Electrocardiogram for chest pain, notify physician

10. Assessment:

NOTE: Body Chart for Recording Results of Radiation Survey and/or Burns can be found on last page of orders

Acute Radiation-related Admission Diagnoses

- a. [Radiation contamination?](#) Yes _____ No _____

See REMM [Body Chart](#) (second to last page) to record whole body radiation survey.

- External contamination with Isotope (Specify or unknown) _____
- Internal contamination with Isotope (Specify or unknown) _____
- Contamination suspected, Isotope uncertain

- b. [Radiation Exposure / Acute Radiation Syndrome \(ARS\)?](#)

Yes _____ No _____

- Estimated whole body dose from exposure _____ (units of gray/Gy)
- See also **Radiation Dose Assessment Section** for additional radiation details and work-up

c. Suspected Organ Involvement:

- Haematologic
- Dermatologic
- Neurovascular
- Gastrointestinal

Other potential complicating factors

- Mass casualty incident

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___ Other, Specify _____

Specific populations potentially requiring more customized management?

Yes ___ No ___

___ Infant (< 1 y)

___ Child (1-18 y)

___ Pregnant/Possibly pregnant Duration of Pregnancy (weeks): _____

___ Immunosuppressed: _____

___ Other, Specify _____

- See REMM page about [At-Risk/Special Needs Populations](#)

11. Management:

Discharge to outpatient – see separate outpatient care prototype (TBD)

Inpatient orders:

Repeat Vital Signs: Weight, Temp, Pulse, BP every _____ hours

Body weight every _____ days

Pulse Ox: frequency _____

Notify physician for:

Temperature ___ > 38 °C _____ Other: _____

SBP: ___ > 180, < 100 _____ Other: _____

DBP: ___ > 100 < 50 _____ Other: _____

HR: ___ > 100 < 50 _____ Other: _____

RR: ___ > 30 < 8 _____ Other: _____

O2 saturation: ___ < 92% _____ Other: _____

Activity:

_____ Bed rest

_____ Ambulate in room only

_____ Ambulate ad lib

Diet:

_____ Regular Diet _____ Liquids (full, clear) _____ NPO

_____ Advance as tolerated

_____ Low microbial diet (for neutropenia)

_____ Special dietary needs/requests: _____

_____ **Monitor I / O**

Frequency _____

_____ **Use radiation precautions for urine and feces** for patients with internal radiation contamination.



12. Precautions

Infectious:

- Contact
- Droplet
- Airborne
- Reverse Isolation/Neutropenic

Radiation precautions

- **For persons with** known or suspected [external or internal contamination](#).
- **Persons with exposure but NO [contamination](#) are NOT radioactive.**
- **Patients with** exposure only do not need Radiation Precautions.

- **Precautions:** Single room, gown, mask, cap, boots, and gloves
- Use medical facility procedures for discarding all biological/physical/radioactive waste, including linens/towels/trash/personal protective equipment.
- **Contact Radiation Safety Officer for additional instructions.**
- Phone: _____ Pager: _____
- Place **Radiation Safety Sign** on door if patient has internal or external radioactive contamination; in accordance with hospital radiation safety protocol
- 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 assigned by Radiation Safety.
- Use medical facility procedures for disposal of **radiation** waste, including linens/towels/trash/personal protective equipment.

- **See guidance**
 - [2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings](#) Healthcare Infection Control Practices Advisory Committee (HHS/CDC)

13. Placement intravenous access:

peripheral IV _____; central line catheter _____

14. Standing labs / studies, if needed

- 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

- Other _____ (specify test and frequency)

15. Transfusions

(May set institutional transfusion parameters, e.g.: PRBC transfusion for Hgb < (7 g/dl) and platelet count < 20000/microL unless otherwise specified

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by medical staff.)

For ___ units or ___ ml of packed red blood cells (~10-15 ml/kg)

For ___ units or ___ ml of platelets (~5-10 ml/kg)

Note:

- Use only leukoreduced AND irradiated products, if available, unless it is known **with certainty** that the patient was exposed to **whole body dose of radiation less than 100 cGy**.
- If radiation whole body dose is **not known** with certainty, leukoreduced AND irradiated products are preferred, if available.
- See [REMM blood use page](#) for additional information.

16. IV fluid management: (including requirements for burns, if present)

See [REMM burn page](#) for details of fluid replacement

___ IV Fluids: ___ @ ___ mL/hr, with additive ___

___ IV Fluids: ___ @ ___ mL/hr, with additive ___

17. ___ Foley catheter management (specify) _____

___ Use radiation precautions for urine and feces for patients with internal radiation contamination.

18. Deep Venous Thrombosis (DVT) prophylaxis: (Age group 14 and above as needed)

___ TED hose to Bilateral Lower-Extremities

___ Sequential Compression Devices (SCD)

___ Anticoagulation regimen _____

___ Other

Note: The potential benefit of any anticoagulation regimen should be balanced against the risk of excessive bleeding in patients with severe thrombocytopenia or significant gastrointestinal toxicity.

19. Admit to:

___ Inpatient Service _____ Area _____

___ Team: _____ PICU _____

___ Hem/Onc: _____ Hematopoietic Stem Cell Transplantation: _____

___ Admitting Physician: _____ Pager: _____

___ Attending Physician: _____ Pager: _____

___ Other Physician: _____ Pager: _____

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20. Diagnoses

Acute/Chronic Non-radiation Related Admission Diagnoses:

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

Ongoing medications related to pre-existing conditions:

- a. _____
- b. _____
- c. _____
- d. _____

21. Consultations: urgent yes or no (blank = N/A)

- | | |
|---|---|
| <input type="checkbox"/> Pediatric Hematology/Oncology | <input type="checkbox"/> ICU |
| <input type="checkbox"/> Intensive Care | <input type="checkbox"/> Transfusion Medicine |
| <input type="checkbox"/> Hematopoietic Stem Cell Transplantation | <input type="checkbox"/> Radiation Oncology |
| <input type="checkbox"/> Mental Health / Psychiatry | <input type="checkbox"/> Endocrinology |
| <input type="checkbox"/> Ophthalmology | <input type="checkbox"/> Palliative Care and Pain Service |
| <input type="checkbox"/> Dermatology / Plastic Surgery | <input type="checkbox"/> Gastroenterology |
| <input type="checkbox"/> Radiation Safety | <input type="checkbox"/> Burn Team |
| <input type="checkbox"/> Surgery: <input type="checkbox"/> General <input type="checkbox"/> Trauma <input type="checkbox"/> Burn <input type="checkbox"/> Thoracic <input type="checkbox"/> Orthopedics | |
| <input type="checkbox"/> Hepatology | <input type="checkbox"/> Infectious Disease |
| <input type="checkbox"/> Pulmonary | <input type="checkbox"/> Plastic Surgery |
| <input type="checkbox"/> Cardiology | <input type="checkbox"/> Nephrology |
| <input type="checkbox"/> ENT | <input type="checkbox"/> Social Services |
| <input type="checkbox"/> Physical/occupational therapy | <input type="checkbox"/> Respiratory Therapy |
| <input type="checkbox"/> Psychiatry | <input type="checkbox"/> Nutritionist/ Dietician |
| <input type="checkbox"/> Medical Toxicology | <input type="checkbox"/> Other _____ |

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22. Respiratory Therapy:

Use radiation precautions for personnel, equipment, and waste if patient has internal radiation contamination.

Room air Chest tube care (Specify) _____

Titrate oxygen supplementation for Oxygen saturation > _____%

Bi-PAP

Nebulizer treatment (Specify) _____

23. Wound care: (see also [REMM burn page](#))

Decontaminate external wounds if there is external radiation contamination. See REMM radiation [contaminated wound](#) care recommendations.

Sterile dressing to wounds daily/BID

Monitor waste

Use medical facility procedures for discarding biological/**radioactive**/physical waste and linens/towels/trash/personal protective equipment.

Radiation precautions (needed if patient has radiation contamination)

Silvadene (Silver Sulfadiazine) cream topically to burns (but not face)
Specify location, frequency: _____

Other topical silver impregnated burn treatment (e.g. Acticoat, Restore)
Specify medication, location, frequency: _____

Other burn treatment: (e.g., ReCell) Specify: _____

Bacitracin topically to burns/BID

Plastic Surgery Consultation

Other wound management per **Burn Team/Dermatology/Surgery**:
Pager _____ Phone _____

Consider [referral to American Burn Association Burn Center](#)

24. Orthopedic care:

Splint/brace/cast/crutches

Other orthopedic management procedure per orthopedics: Pager _____ Phone _____



25. Radiation Dose Assessment

A. Biodosimetry and Bioassay assays (reference material)

- [Difference between Biodosimetry and Bioassay](#)
- [Define biodosimetry](#)
- [More about biodosimetry](#)
- [Dicentric chromosome assay](#)

B. Biodosimetry assays for [radiation exposure](#)

- See REMM information on
 - [Dose Estimator for Exposure: 3 biodosimetry tools](#)
 - [Dose Reconstruction](#)

- **Estimated whole body dose from exposure:** _____ (Gray)
 - Using which tool(s) _____

e.g., vomiting, lymphocyte depletion kinetics, dicentric chromosome assay
 Note: if different assays give different results

- METREPOL Scores: Heme____GI____Neuro____Cutaneous____
- Response Category (RC score) _____
[Explain METREPOL](#)
[Consider Response Category in clinical triage](#) (Interactive tool for ARS)
- Date of exposure: _____
- Time of exposure: _____
- Location of patient at time of exposure: _____
- Estimated whole body/partial body dose, specify _____(dose)
- Dose unknown: _____

Dicentric Chromosome Assay Instructions:

- Draw extra green top tube and provide: date _____ time _____
- See REMM for location of approved US [laboratories that perform this test](#).
- Send this tube **ON ICE** for outside lab study
 - To the attention of: _____
 - Name of lab: _____
 - Address of lab: _____

C. [Radiation bioassay for evaluating/managing internal decontamination](#)

- Collect ≥ 70 mL Spot urine for _____(name of radioactive isotope)
 - Directions for sample collection, labeling, packaging and shipping bioassay specimen to CDC bioassay lab:
<https://emergency.cdc.gov/radiation/labinfo.asp>

Note: Consult senior radiation event medical managers for name and location of other laboratories that may be available to perform this test in a mass casualty incident. Routine labs generally cannot perform this test, although in large incidents, senior managers may announce special arrangements.



26. General Medications:

- Clinical Pharmacist or PharmD managed medication dosing is essential
- Suggested dose ranges for **pediatric patients (PEDS)** are suggested but not mandated.
- Cytokines (If pt has not already received from first responders- see Neutropenia section below)
- Drug names are generally listed as follows **Generic (Brand)** names
- Some drugs with **bold blue font** have **DailyMed** web site hyperlinks with additional information.

For gastric acid suppression:

- **Lansoprazole (Prevacid)**
PEDS: 1 to 2 mg/kg, max 30 mg/dose
Dose: _____

For radiation-induced nausea & vomiting:

- **Ondansetron (Zofran)**
PEDS: 0.15 mg/kg, max 8 mg/dose, IV/PO Q 8hrs PRN.
Dose: _____
- **Lorazepam (Ativan)** for anxiety/insomnia/breakthrough nausea
PEDS: 0.025 -0.05 mg/kg, max 2 mg/dose IV/PO q 6 hrs PRN.
Dose: _____
- **Hydroxyzine (Vistaril)** capsules and oral suspension
PEDS: children under 6 years: 50 mg daily in divided doses
children over 6 years: 50-100 mg daily in divided doses
- **Prochlorperazine** for anxiety/insomnia/breakthrough nausea
PEDS: Children ≥ 2 years and weight ≥ 9 kg and Adolescents
(NOTE: Administer with **Diphenhydramine** to mitigate risk of dystonia.
Some prefer not to use this medication in children to avoid extrapyramidal symptoms.)

Oral Prochlorperazine:

- 9-13 kg: 2.5 mg every 12-24 hours as needed; max daily dose: 7.5 mg/day
- >13-18 kg: 2.5 mg every 8-12 hours as needed; max daily dose: 10 mg/day
- >18-39 kg: 2.5 mg every 8 hours **or** 5 mg every 12 hours as needed;
max daily dose: 15 mg/day
- >39 kg: 5-10 mg every 6-8 hours; usual max daily dose: 40 mg/day

See [REMM bibliography on treatment of nausea and vomiting](#)

For fever:

- **Acetaminophen (Tylenol)** q 6 – 8h PRN temperature > 38 °C
PEDS: 15 mg/kg/dose, max 650 mg PO Q 6 hrs PRN. Max
75mg/kg/day Dose: _____

For diarrhea:

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For rash and itching (unrelated to radiation exposure):

___ **Topical steroid:** _____ Medication Name
___ Cream/lotion/ointment ___ Strength ___ Frequency ___

Diphenhydramine hydrochloride (**Benadryl**)

PEDS: 0.5 mg/kg - 1 mg/kg, max 50 mg IV/PO Q 6 hrs PRN.

Dose _____

For pain:

___ **Morphine Sulfate**

PEDS: **IV** 0.05 mg/kg Q 2-4 hrs PRN

Usual initial max dose:

Infants: 2 mg/dose

1 to 6 years: 4 mg/dose

7 to 12 years: 8 mg/dose

>12 years: 10 mg/dose

PO 0.2-0.5 mg/kg, Q 4 hrs PRN

Usual initial max dose: 15 – 20 mg

**PCA starting dose recommendation 0.015-0.02 mg/kg/dose,
lockout 8-10 minutes, or continuous 0-0.02 mg/kg/hr and
hourly max 0.1-0.12 mg/kg/hr.

Dose _____

___ **Other pain medication** Specify: name, dose, route, frequency _____

For skin burns: (see also: [REMM burn page](#) and **wound care section** of these orders)

Record burn area(s) on body diagram and [% Body Surface Area affected](#)

(See body chart on page 22)

Burn topical regimen _____

Replace body fluid _____

Other burn therapy _____

Consider [referral to American Burn Association Burn Center](#): _____

For oral mucositis:

Mouth care regimen _____

27. Radioisotope decorporation or blocking agents

- **Note:** Only FDA approved radiation countermeasures are listed in table below.
- See [REMM table](#) longer list of countermeasures which have been recommended by some experts but are not FDA approved as radiation countermeasures.
- Pediatric administration of these should be discussed with toxicology experts in order to optimize risk/benefit.
- Adult and pediatric doses are noted below.

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Medical Countermeasure	Administered for	Route of Administration	Dosage	Duration
<p>Ca-DTPA¹ Zn-DTPA¹</p> <p>See REMM's DTPA information.</p> <p>See FDA's Zn-DTPA drug label.</p> <p>See FDA's Ca-DTPA drug label.</p>	<p>Americium (Am-241)¹</p> <p>Curium (Cm-244)¹</p> <p>Plutonium (Pu-238 and Pu-239)¹</p>	<p>IV¹: Give once daily as a bolus or as a single infusion, i.e., do not fractionate the dose.</p> <p>DTPA is FDA-approved for intravenous Rx of known or suspected internal contamination with Am, Cm, and Pu only.</p> <p>Nebulized inhalation¹: DTPA is FDA-approved for nebulized inhalation in adults only, and if the route of contamination is through inhalation.</p>	<p>IV: 1 g in 5 cc 5% dextrose in</p> <p>PEDS: <12 years old: 14 mg/kg IV qd, no more than 1g/day</p> <p>Nebulized inhalation: 1 g in 1:1 dilution with sterile water or NS over 15-20 min</p> <p>PEDS: nebulized dosing same as adults</p>	<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
<p>Potassium iodide¹</p> <p>See REMM's KI summary information.</p> <p>See FDA's KI information.</p>	<p>Iodine (I-131)</p> <p>[For projected thyroid gland exposure $\geq 5\text{cGy}$]</p> <p>(NOTE: for the prevention of the uptake of radioactive iodine released from a nuclear power plant meltdown)</p>	PO	<p>(Adolescents ≥ 150 lbs. should receive the full adult daily dose (130 mg/d)</p> <p>Adolescents, 12 through 18 years: 65 mg/d</p> <p>Over 3 years through 12 years: 65 mg/d</p> <p>1 month through 3 years: 32 mg/d [Use KI oral solution with 65 mg/mL.]</p> <p>Birth through 1 month: 16 mg/d [Use KI oral solution with 65 mg/mL.]</p>	<ul style="list-style-type: none"> • See FDA pediatric dosing recommendations, including liquid vs. tablet options • Some incidents 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. • See FDA information on duration of therapy.

Medical Countermeasure	Administered for	Route of Administration	Dosage	Duration
<p>Prussian blue, insoluble¹</p> <p>See REMM's Prussian Blue summary information.</p> <p>See FDA's Prussian Blue drug label.</p>	<p>Cesium (Cs-137)</p> <p>Thallium (Tl-201)</p>	PO	<p>PEDS: > 12 yrs: 3 g po TID</p> <p>2-12 yrs: 1 gm TID</p> <p>Prussian Blue in currently not approved for children < 2 years of age. During an actual emergency, consult with managers to see if EUA is available.</p>	<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



28. Neutropenia therapy and antimicrobials Neutropenia therapy, if indicated:

Neutropenia definition:

Total count of neutrophils + bands in the peripheral blood <1,000 /microL

- The 3 drugs listed below have been approved by the FDA for the indication of acute exposure to myelosuppressive doses of radiation
- See [REMM cytokines page](#) for more detailed information, especially potential need for [dose alterations during large mass casualty incidents when medical countermeasures may be scarce](#).

Myeloid cytokines approved by the FDA for the indication of acute exposure to myelosuppressive doses of radiation

Cytokine	Dose
G-CSF or filgrastim (Neupogen drug label)	<ul style="list-style-type: none"> • 10 mcg/kg/day as a single daily subcutaneous injection in adults and children (IV optional based on availability) • Continue administration daily until absolute neutrophil count remains greater than 1,000/mm³ (= 1.0 x 10⁹ cells/L) for 3 consecutive (daily) CBCs or exceeds 10,000/mm³ (= 10 x 10⁹ cells/L) after a radiation- induced nadir. • See REMM cytokines page for more information about potential dose alterations during large mass casualty incidents when medical countermeasures may be scarce.
Pegylated G-CSF or pegfilgrastim (Neulasta drug label)	<ul style="list-style-type: none"> • Pediatric patients weighing less than 45 kg: refer to table in Neulasta drug label⁴ (on page 24-25 of this orders document) for dose calculated by weight. Administer two doses of drug subcutaneously one week apart, if second dose is needed • A CBC should be obtained prior to administration of the second dose of Neulasta. Subject matter experts recommend not administering the second dose if absolute neutrophil count is greater than 5,000/mm³ (= 5.0 x 10⁹ cells/L). • See REMM cytokines page for more information about potential dose alterations during large mass casualty incidents when medical countermeasures may be scarce.

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<p>Pegylated G-CSF or Pegfilgrastim-cbqv (biosimilar to Neulasta) (Udenyca drug label)</p>	<ul style="list-style-type: none"> • Pediatric patients weighing less than 45 kg: refer to table in Udenyca drug label⁵ (on page 24-25 of this orders document) for dose calculated by weight. Administer two doses of drug subcutaneously one week apart, if second dose is needed • A CBC should be obtained prior to administration of the second dose of Neulasta. Subject matter experts recommend not administering the second dose if absolute neutrophil count is greater than 5,000/mm³ (= 5.0 x 10⁹ cells/L). <ul style="list-style-type: none"> • See REMM cytokines page for more information about potential dose alterations during large mass casualty incidents when medical countermeasures may be scarce.
<p>Pegylated G-CSF or Pegfilgrastim-fpgk (biosimilar to Neulasta) (Stimufend drug label)</p>	<ul style="list-style-type: none"> • Pediatric patients weighing less than 45 kg: refer to table in Stimufend drug label⁶ (on page 24-25 of this orders document) for dose calculated by weight. Administer two doses of drug subcutaneously one week apart, if second dose is needed • A CBC should be obtained prior to administration of the second dose of Neulasta. Subject matter experts recommend not administering the second dose if absolute neutrophil count is greater than 5,000/mm³ (= 5.0 x 10⁹ cells/L). <ul style="list-style-type: none"> • See REMM cytokines page for more information about potential dose alterations during large mass casualty incidents when medical countermeasures may be scarce.
<p>GM-CSF or sargramostim (Leukine drug label)</p>	<ul style="list-style-type: none"> • A subcutaneous injection administered once daily as follows-- • 7 mcg/kg in adult and pediatric patients weighing greater than 40 kg • 10 mcg/kg in pediatric patients weighing 15 kg to 40 kg • 12 mcg/kg in pediatric patients weighing less than 15 kg • Continue administration of Leukine until absolute neutrophil count remains greater than 1,000/mm³ (= 1.0 x 10⁹ cells/L) for 3 consecutive CBCs or exceeds 10,000/mm³ (= 10 x 10⁹ cells/L) after a radiation- induced nadir. • See drug label for prescribing information, especially warning related to diluent use in infants and premature infants. • See REMM cytokines page for more information about potential dose alterations during large mass casualty incidents when medical countermeasures may be scarce.

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<p>Neupogen Biosimilar: G-CSF: filgrastim-txid (Nypozi Drug Label)</p>	<ul style="list-style-type: none"> Administer 10 mcg/kg/day as a single daily subcutaneous injection in adults and children for the FDA-approved indication of acute exposure to myelosuppressive doses of radiation. Continue daily administration until absolute neutrophil count remains greater than 1,000/mm³ (= 1.0 x 10⁹ cells/L) for 3 consecutive (daily) CBCs or exceeds 10,000/mm³ (= 10 x 10⁹ cells/L) after a radiation-induced nadir. Vial sizes are 300 mcg and 480 mcg. For a 70 kg person, 2 vials of either size would be the appropriate dose. It would be reasonable to indicate a maximum dose like 960 mcg OR two vials per dose though this is not uniformly agreed upon. Note that if the appropriate dose requires administration of 2 vials, separate injection sites would be required. See REMM cytokines page for more information about potential dose alterations during large mass casualty incidents when medical countermeasures may be scarce. 															
<p>Pegylated G-CSF: (biosimilar to Neulasta) Pegfilgrastim-bmez (Ziextenzo drug label)</p>	<ul style="list-style-type: none"> Two doses, 6 mg each, administered subcutaneously one week apart; dosing in pediatric patients weighing less than 45 kg, refer to Table below. A CBC should be obtained prior to administration of the second dose of Neulasta. Subject matter experts recommend not administering the second dose if absolute neutrophil count is greater than 5,000/mm³ (= 5.0 x 10⁹ cells/L). See REMM cytokines page for more information about potential dose alterations during large mass casualty incidents when medical countermeasures may be scarce. <p style="text-align: center;">Dosing of ZIEXTENZO for pediatric patients weighing less than 45 kg</p> <table border="1" data-bbox="521 1236 1458 1383"> <thead> <tr> <th>Body Weight</th> <th>ZIEXTENZO Dose</th> <th>Volume to Administer</th> </tr> </thead> <tbody> <tr> <td>Less than 10 kg*</td> <td>See below*</td> <td>See below*</td> </tr> <tr> <td>10 - 20 kg</td> <td>1.5 mg</td> <td>0.15 mL</td> </tr> <tr> <td>21 - 30 kg</td> <td>2.5 mg</td> <td>0.25 mL</td> </tr> <tr> <td>31 - 44 kg</td> <td>4 mg</td> <td>0.4 mL</td> </tr> </tbody> </table> <p><small>*For pediatric patients weighing less than 10 kg, administer 0.1 mg/kg (0.01 mL/kg) of ZIEXTENZO.</small></p>	Body Weight	ZIEXTENZO Dose	Volume to Administer	Less than 10 kg*	See below*	See below*	10 - 20 kg	1.5 mg	0.15 mL	21 - 30 kg	2.5 mg	0.25 mL	31 - 44 kg	4 mg	0.4 mL
Body Weight	ZIEXTENZO Dose	Volume to Administer														
Less than 10 kg*	See below*	See below*														
10 - 20 kg	1.5 mg	0.15 mL														
21 - 30 kg	2.5 mg	0.25 mL														
31 - 44 kg	4 mg	0.4 mL														
<p>Romiplostim (Nplate, drug label)</p>	<ul style="list-style-type: none"> 10 mcg/kg administered once as a subcutaneous injection. Nplate is indicated to increase survival in adults and in pediatric patients (including term neonates) acutely exposed to myelosuppressive doses of radiation. Administer the dose as soon as possible after suspected or confirmed exposure to myelosuppressive doses of radiation The FDA drug label says that for treatment of myelosuppressive doses of radiation: “Administer romiplostim regardless of whether a complete blood count (CBC) can be obtained.” “Estimate a patient’s absorbed whole body radiation dose (i.e., level of radiation exposure) based on information from public health authorities, biodosimetry if available, or clinical findings such as time to onset of vomiting or lymphocyte depletion kinetics.” See REMM cytokines page for more information about potential dose alterations during large mass casualty incidents when medical countermeasures may be scarce. 															



For Antimicrobial therapy **with neutropenia (no fever):**

Neutropenia definition: Total count of neutrophils + bands in the peripheral blood <1,000 /microl

- For patients with neutropenia who have NOT HAD NEUTROPENIC FEVER.
- Use as appropriate for each patient.
- Drugs listed are examples only.

Anti-bacterial prophylaxis:

 Levofloxacin (Levaquin) (neutropenia without fever)

6 months to 4 years old:

Oral, IV: 8 to 10 mg/kg/dose twice daily;

Maximum dose: 250 mg

Dose: _____

≥5 years:

Oral, IV: 10 mg/kg/dose once daily; maximum dose: 500 mg/day

(Increase max to 750 mg/day if treating pneumonia)

Dose: _____

Anti-viral prophylaxis (neutropenia without fever)

 Acyclovir (Zovirax)

Dosing varies based on diagnosis of VZV or HSV; see drug label for details

PEDS:

Weight ≤ 40 kg: 60-80 mg/kg/day PO in 2-3 divided doses, with max 200 mg PO q8h

Weight > 40kg: 400 mg PO q 12 h

Dose: _____

Anti-fungal prophylaxis (neutropenia without fever)

 Fluconazole (Diflucan) dose considered beginning when absolute neutrophil count (ANC) becomes < 1000

6 mg/kg PO/IV daily, max 400 mg daily

Dose: _____

or

 Posaconazole (Noxafil) with food – beginning when absolute neutrophil count (ANC) becomes < 1000.

Oral suspension: < 12 years: 4 mg/kg PO TID; >12 years: 200 mg PO TID

DR tablets: Adolescents: 300 mg PO twice daily on day 1, then 300 mg PO daily

Note: IV formulation is not FDA approved in children < 18 years of age because of “non-clinical safety concerns”.

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[**Note: Consider prophylaxis for Pneumocystis jirovecii in immunocompromised patients.**]

Note: FDA drug label cautions for this drug in pediatric patients, especially those < 13 years of age. Drug label includes various dosing options.

For treatment of neutropenia AND fever (defined as T>38 °C while neutropenic)

Anti-microbial work-up and therapy

- Blood cultures
- Sputum culture + sensitivity
- Urinalysis w/culture
- Chest x-ray

Cefepime (Maxipime)

PEDS: 50 mg/kg, max 2000 mg IV Q8h
Dose: _____

Vancomycin (Vancocin)

Consider if: suspected catheter-related infection, skin or soft tissue infection, pneumonia or hemodynamic instability.
Consider trough level before 4th dose
PEDS: 15 mg/kg IV Q6-8h Dose: _____

Antifungal therapy

[**Note: Consider prophylaxis for Pneumocystis pneumonia in immunocompromised patients.**]

Consider one of the following if: fever >72 hours on antibacterial therapy, evidence of fungal infection or hemodynamic instability.

Voriconazole (Vfend)

PEDS: 2 to 11 years: 9 mg/kg Q12H for two doses then 8 mg/kg IV Q12h
≥12 yr or ≥ 50 kg: 6 mg/kg IV q12h for two doses, then 4 mg/kg IV q12h
Dose: _____

Caspofungin (Cancidas)

PEDS: 70 mg/m² IV once, then 50 mg/m² IV daily
(max dose 70 mg once then 50 mg daily)
Dose: _____

Posaconazole (Noxafil) with food – beginning when absolute neutrophil count (ANC) becomes < 1000.

Oral suspension: < 12 years: 4 mg/kg PO TID; >12 years: 200 mg PO TID
DR tablets: Adolescents: 300 mg PO twice daily on day 1, then 300 mg PO daily

IV is not FDA approved in children < 18 years of age because of “non-clinical safety concerns”.

Note: See FDA drug label cautions for this drug in pediatric patients, especially those < 13 years of age. Drug label includes various dosing options.

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___ **Liposomal amphotericin B (AmBisome)** See drug label for cautions.
PEDS dose: 3-5 mg/kg/day IV over 2h
Dose: _____

___ **Amphotericin B lipid complex (Abelcet)** See drug label for cautions.
PEDS dose: 5 mg/kg/day IV over 2h (2.5 mg/kg/hr)
Dose: _____

See [Fever and Neutropenia Guidelines for children with cancer](#)

- Lehrnbecher T, Phillips R, Alexander S, Alvaro F, Carlesse F, Fisher B, Hakim H, Santolaya M, Castagnola E, Davis BL, Dupuis LL, Gibson F, Groll AH, Gaur A, Gupta A, Kebudi R, Petrilli S, Steinbach WJ, Villarroel M, Zaoutis T, Sung L. [Guideline for the management of fever and neutropenia in children with cancer and/or undergoing hematopoietic stem-cell transplantation](#). J Clin Oncol. 2012 Dec 10;30(35):4427-38. [PubMed Citation]
- Editorial on this guideline: Pulsipher MA, [Pediatric-specific guidelines for fever and neutropenia: a catalyst for improving care and focusing research](#). J Clin Oncol. 2012 Dec 10;30(35):4292-3. [PubMed Citation]

NOTES

1. FDA approved for this indication.
2. **Pegfilgrastim (Neulasta)**

Weight-based Dosing for Pediatric Patients Weighing Less than 45 kg (from drug label dated 11/2015)

Body Weight	Pegfilgrastim Dose	Volume to Administer
Less than 10 kg*	See below*	See below*
10 - 12 kg	1.5 mg	0.15 mL
21 - 30 kg	2.5 mg	0.25 mL
31 - 44 kg	4 mg	0.40 mL

* For pediatric patients weighing less than 10 kg, administer 0.1 mg/kg (0.01 mL/kg) of Neulasta.

See [drug label information](#) regarding how to administer drug for pediatric patients receiving doses less than 6 mg.

3. **Pegfilgrastim-cbqv (Udenyca)**

Weight-based Dosing for Pediatric Patients Weighing Less than 45 kg (from drug label dated 03/2023)

Body Weight	Pegfilgrastim Dose	Volume to Administer
Less than 10 kg*	See below*	See below*
10 - 12 kg	1.5 mg	0.15 mL
21 - 30 kg	2.5 mg	0.25 mL
31 - 44 kg	4 mg	0.40 mL

* For pediatric patients weighing less than 10 kg, administer 0.1 mg/kg (0.01 mL/kg) of Udenyca

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See [drug label information](#) regarding how to administer drug for pediatric patients receiving doses less than 6 mg.

4. Pegfilgrastim-fpgk (Stimufend)

**Weight-based Dosing for Pediatric Patients Weighing Less than 45 kg
(from drug label dated 09/2023)**

Body Weight	Pegfilgrastim Dose	Volume to Administer
Less than 10 kg*	See below*	See below*
10 - 12 kg	1.5 mg	0.15 mL
21 - 30 kg	2.5 mg	0.25 mL
31 - 44 kg	4 mg	0.40 mL

* For pediatric patients weighing less than 10 kg, administer 0.1 mg/kg (0.01 mL/kg) of Stimufend.

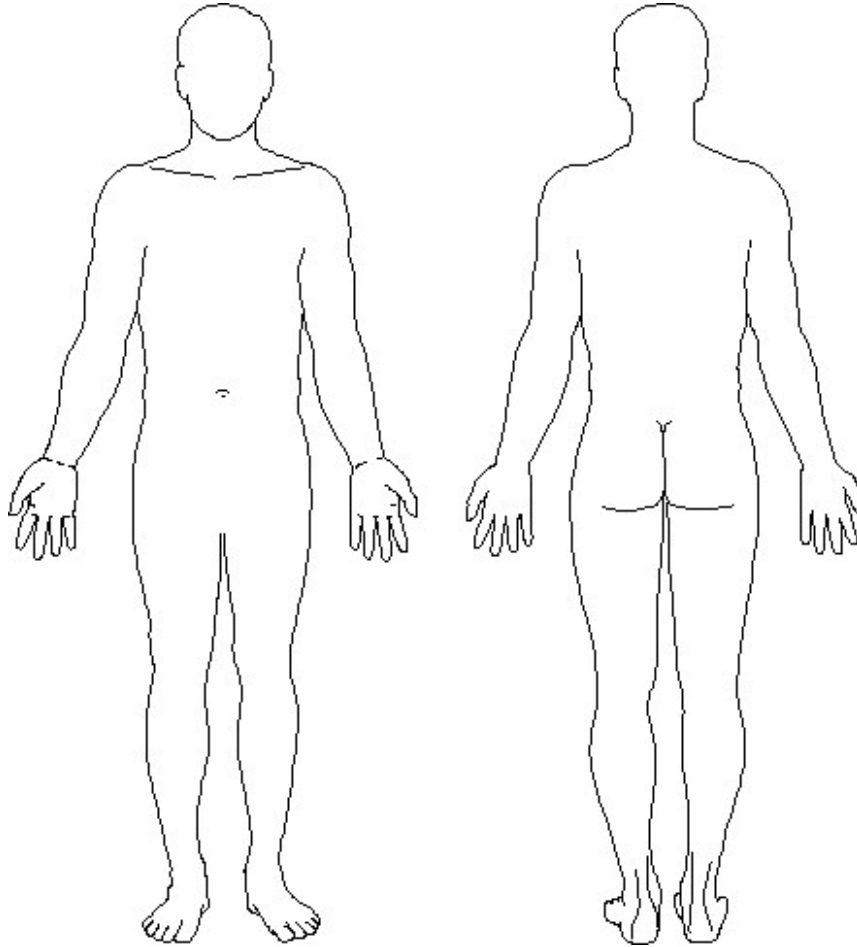
See [drug label information](#) regarding how to administer drug for pediatric patients receiving doses less than 6 mg.

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Body Chart for Recording Results of Radiation Survey and/or Burns



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Pediatric Vital Signs Reference Chart

This table, along with our detailed references can be found online at <http://www.pedscases.com/pediatric-vital-signs-reference-chart>. For a more detailed approach to this topic, see our podcast on "Pediatric Vital Signs."

Heart Rate			Respiratory Rate	
Normal Heart Rate by Age (beats/minute) Reference: PALS Guidelines, 2015			Normal Respiratory Rate by Age (breaths/minute) Reference: PALS Guidelines, 2015	
Age	Awake Rate	Sleeping Rate	Age	Normal Respiratory Rate
Neonate (<28 d)	100-205	90-160	Infants (<1 y)	30-53
Infant (1 mo-1 y)	100-190	90-160	Toddler (1-2 y)	22-37
Toddler (1-2 y)	98-140	80-120	Preschool (3-5 y)	20-28
Preschool (3-5 y)	80-120	65-100	School-age (6-11 y)	18-25
School-age (6-11 y)	75-118	58-90	Adolescent (12-15 y)	12-20
Adolescent (12-15 y)	60-100	50-90		
Blood Pressure				
Normal Blood Pressure by Age (mm Hg) Reference: PALS Guidelines, 2015				
Age	Systolic Pressure	Diastolic Pressure	Systolic Hypotension	
Birth (12 h, <1000 g)	39-59	16-36	<40-50	
Birth (12 h, 3 kg)	60-76	31-45	<50	
Neonate (96 h)	67-84	35-53	<60	
Infant (1-12 mo)	72-104	37-56	<70	
Toddler (1-2 y)	86-106	42-63	<70 + (age in years x 2)	
Preschooler (3-5 y)	89-112	46-72	<70 + (age in years x 2)	
School-age (6-9 y)	97-115	57-76	<70 + (age in years x 2)	
Preadolescent (10-11 y)	102-120	61-80	<90	
Adolescent (12-15 y)	110-131	64-83	<90	
For diagnosis of hypertension refer to the NHBPEP Reference tables: http://www.nhlbi.nih.gov/health-pro/guidelines/current/hypertension-pediatric-jnc-4/blood-pressure-tables .				
Temperature		Oxygen Saturation		
Normal Temperature Range by Method Reference: CPS Position Statement on Temperature Measurement in Pediatrics, 2015		Normal pediatric pulse oximetry (SPO2) values have not yet been firmly established. SPO2 is lower in the immediate newborn period. Beyond this period, a SPO2 of <92% should be a cause of concern and may suggest a respiratory disease or cyanotic heart disease.		
Method	Temperature (°C)			
Rectal	36.6-38			
Ear	35.8-38			
Oral	35.5-37.5			
Axillary	36.5-37.5			
Temperature ranges do not vary with age. Axillary, tympanic and temporal temps for screening (less accurate). Rectal and oral temps for definitive measurement (unless contraindication).				

Developed by Chris Novak and Peter Gill for PedsCases.com. April 21, 2016.

Source: PedsCases.com
 About: PedsCases