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 Adult 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 adult drug doses in this prototype are based on a 70 kg adult with normal renal and hepatic function.
- Appropriate dose adjustments should be made based on age, weight, drug-drug interactions, nutritional status, renal, and hepatic function.

Mass Casualty Emergency

- After a mass casualty Emergency, 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.

- This is **Version date January 25, 2019 of the Adult Order set template.**
  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://www.remm.nlm.gov/adultorderform.htm](https://www.remm.nlm.gov/adultorderform.htm)
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1. Administrative information

Name: ____________________________
Unique Identifier: _____________
Address: ____________________________
Phone: _________________
Spoken language: ______________
Unaccompanied minor: ___________
Date of Birth: _______________
Age (years): _______
Gender: _______________________

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

2. Admit to:

__ Inpatient Service _____________ Area _____________
__ Team: ________________ PICU _____________
__ Hem/Onc: ________________ Hematopoietic Stem Cell Transplantation: ____
__ Admitting Physician: _____________ Pager: _____________
__ Attending Physician: _____________ Pager: _____________
__ Other Physician: _____________ Pager: _____________
3. Diagnoses

**Acute/Chronic Non-radiation Related Admission Diagnoses:**

a. ______________________________________

b. ______________________________________

c. ______________________________________

d. ______________________________________

e. ______________________________________

f. ______________________________________

**Acute Radiation-related Admission Diagnoses:**

a. **Radiation contamination?**  Yes____ No____

   See REMM [Body Chart](#) (page 19) 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 Item #24, page 11 for additional radiation details and work-up

**Other potential complicating factors**

___ Mass casualty incident

___ Other, Specify ______________________

**Specific populations potentially requiring more customized management?**

Yes____ No____

___ Age > 65 y

___ Pregnant/Possibly pregnant and duration of pregnancy (weeks): _____
_Immunosuppressed_

____Other, Specify ________________________________

- See REMM page about at-risk and special needs populations

4. **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

____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

5. Urgent consultations: specify

__ Intensive Care  __ Transfusion Medicine
__ Hematopoietic Stem Cell Transplantation  __ Radiation Oncology
__ Mental Health / Psychiatry  __ Endocrinology
__ Ophthalmology  __ Palliative Care and Pain Service
__ Dermatology / Plastic Surgery  __ Gastroenterology
__ Radiation Safety  __ Burn Team
__ Surgery: ___ General  ___ Trauma  ___ Thoracic  ___ Orthopedics
__ Hepatology  __ Infectious Disease
__ Pulmonary  __ Plastic Surgery
__ Cardiology  __ Nephrology
__ ENT  __ Social Services
__ Other ___________________

6. Condition:

__ Good  _ Fair  _ Stable  _ Guarded  _ Critical

7. Vital Signs: Temp, Pulse, BP

__ q 2 hours X 4  ___ Other frequency: Specify: _________________
__ q 4 hours X 4

__ Pulse Ox: frequency _______________

**Notify physician for:**

Temperature _____ > 38 ºC  ___ Other: ____________
SBP: _____ > 180, <100  ___ Other: ____________
DBP: _____ > 100, < 50  ___ Other: ____________
HR: _____ >100  <50  ___ Other: ____________
RR: _____ >30  <8  ___ Other: ____________
O2 saturation: _____ < 92%  ___ Other: ____________
8. Allergies:

___ No Known Drug Allergies (NKDA)
___ Allergies (drugs, foods)
   If yes, specify: ________________________________

9. Activity:

___ Bed rest
___ Ambulate in room only
___ Ambulate ad lib

10. Diet:

___ Regular Diet  ___ Liquids (full, clear)  ___ NPO
___ Advance as tolerated
___ Low microbial diet (for neutropenia)
___ Special dietary needs/requests: ________________________________

11. Height, weight:

   Height: _____ cm
   Weight: _____ kg

   Repeat body weight: q_____ hours q_____ days

12. Admission studies: Labs

___ CBC w/differential and platelet 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
___ 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)
___ See section #14 for blood bank labs, including Type and Screen or Cross Match
Thyroid Function Tests (Specify) ________________

Wound cultures

Serologies:
- Herpes Simplex Virus type 1 (HSV-1) [unless acyclovir prophylaxis planned]
- Herpes Simplex Virus type 2 (HSV-2) [unless acyclovir prophylaxis planned]
- Cytomegalovirus (CMV)
- Varicella-zoster virus (VZV)
- Epstein Barr Virus (EBV)

Standing labs / studies, if needed
- CBC w/diff and platelets 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)

13. Blood bank
(May set institutional transfusion parameters, e.g.: PRBC transfusion for Hgb < (7 g/dl) and platelet count < 20000/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 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.
14. Imaging

__ Chest x-ray Urgency:________
__ PA/Lateral Urgency:________
__ Portable Urgency:________
__ Other imaging studies Specify:__________________Urgency:________

15. Electrocardiogram

__ Electrocardiogram
__ STAT Electrocardiogram for chest pain, notify physician

16. IV fluid management: (including requirements for burns, if present)
   See REMM burn page for more details about fluid replacement.

__ IV Fluids:_____@______cc/hr, with additive ______
__ IV Fluids:_____@______cc/hr, with additive ______

17. __ Foley catheter management (specify) ______________

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

18. __ Monitor I / O

Frequency __________

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

19. Deep Venous Thrombosis (DVT) prophylaxis:

__ TED hose to Bilateral Lower-Extremities
__ Sequential Compression Devices (SCD)
__ Anticoagulation regimen ________________________________
__ Other

Note: The potential benefit of any anticoagulation regimen (e.g. heparin) should
be balanced against the risk of excessive bleeding in patients with severe
thrombocytopenia or significant gastrointestinal toxicity.
20. 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 >____%  
   ___ Nebulizer treatment (Specify) ________________________________

21. Wound care: (See also REMM burn page and item #24 – skin burns)
   ___ Decontaminate external wounds if there is external radiation contamination.  
     See REMM radiation 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 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

22. Orthopedic care:
   ___ Splint/brace/cast/crutches
   ___ Other orthopedic management procedure per orthopedics:
     Pager___________Phone ___________________________
23. Radiation Dose Assessment

A. Biodosimetry and Bioassay assays
   - 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 emergency medical managers for name and location of other laboratories that may become available to perform this test in a large mass casualty incident. Routine labs generally cannot perform this test, although in large emergencies, senior managers may announce special arrangements.
24. General Medications:

- 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)** 15-30 mg PO daily

**For radiation-induced nausea & vomiting:**

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

See **REMM bibliography on treatment of nausea and vomiting**

**For fever:**

- **Acetaminophen** 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)
- **Diphenoxylate hydrochloride with atropine sulfate (Lomotil)** tablet 2.5 mg
  - 2 tablets PO up to 3 or 4 times/day, not to exceed 20 mg/24 hours
  - Maintenance dose: smaller dose/ less frequent if responding

**For rash and itching (unrelated to radiation exposure):**

- **Topical steroid:** __________ Medication Name
  __________ Cream/lotion/ointment __________ Strength __________ Frequency
- **Diphenhydramine hydrochloride (Benadryl)** 25-50 mg PO q 4-6 hours for pruritis, not to exceed 300 mg/24 hours
For pain:

___ Morphine sulphate _____ mg _____ route _____ frequency

___ Other pain medication (specify): name, dose, route, frequency

For skin burns: (See also REMM burn page and item #21: wound care)

Record burn area(s) on body diagram and % Body Surface Area affected
(See page 21 for body chart.)

Burn topical regimen ____________________________________________

Replace body fluid _____________________________________________

Other burn therapy ____________________________________________

Consider referral to American Burn Association Burn Center: _________

For oral mucositis:

Mouth care regimen ____________________________________________

_____________________________________________________________
25. **Radioisotope decorporation or blocking agents:**

- Note: Only FDA approved radiation countermeasures are listed in table below.
- See **REMM Table** for longer list of countermeasures which have been recommended by some experts but are not FDA approved as radiation countermeasures.

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<th>Administered for</th>
<th>Route of Administration</th>
<th>Dosage</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ca-DTPA&lt;sup&gt;1,3&lt;/sup&gt;</td>
<td>Americium (Am-241)&lt;sup&gt;1&lt;/sup&gt;</td>
<td>IV&lt;sup&gt;1&lt;/sup&gt;: 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 OR 1 g in 100-250 cc D5W or NS as an infusion over 30 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&lt;sup&gt;1,3&lt;/sup&gt;</td>
<td>Californium (Cf—252)&lt;sup&gt;2&lt;/sup&gt;</td>
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<tr>
<td>See REMM's DTPA information.</td>
<td>Cobalt (Co-60)&lt;sup&gt;2&lt;/sup&gt;</td>
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<tr>
<td>See FDA's Zn-DTPA drug label.</td>
<td>Curium (Cm-244)&lt;sup&gt;1&lt;/sup&gt;</td>
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<tr>
<td>See FDA's Ca-DTPA drug label.</td>
<td>Plutonium (Pu-238 and Pu-239)&lt;sup&gt;1&lt;/sup&gt;</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Yttrium (Y-90)&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Nebulized inhalation&lt;sup&gt;1&lt;/sup&gt;: 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>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Medical Countermeasure

<table>
<thead>
<tr>
<th>Administered for</th>
<th>Route of Administration</th>
<th>Dosage</th>
<th>Duration</th>
</tr>
</thead>
</table>
| **Potassium iodide**<sup>1</sup> | Iodine (I-131) | PO | Adults >40 years: 130 mg/day (for projected thyroid exposure ≥500 cGy)  
Adults 18-40 years: 130 mg/day (for projected thyroid exposure ≥10 cGy)  
Pregnant or lactating women of any age: 130 mg/day (for projected thyroid exposure ≥5 cGy) | • 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 REMM page about duration.  
• See FDA page about duration. |
| **Prussian blue, insoluble**<sup>1</sup> | Cesium (Cs-137)  
Thallium (Tl-201) | PO | Adults: 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 |

<sup>1</sup> See REMM’s KI summary information.  
See FDA’s KI information.  

See REMM page on Prussian Blue  
See FDA Prussian Blue information page.  
See FDA’s Prussian Blue drug label.
26. Neutropenia therapy ± antimicrobials

**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 much 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

<table>
<thead>
<tr>
<th>Cytokine</th>
<th>Adult dose</th>
</tr>
</thead>
</table>
| G-CSF or filgrastim (Neupogen drug label) | • 10 mcg/kg/day as a single daily subcutaneous injection in adults and children  
• 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) | • Two doses, 6 mg each, administered subcutaneously one week apart.  
• 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. |
| GM-CSF or sargramostim (Leukine® drug label) | • 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 REMM cytokines page for more information about potential dose alterations during large mass casualty incidents when medical countermeasures may be scarce. |
See Clinical Practice Guidelines for Myeloid Cytokines (for Adults)

- NCCN Clinical Practice Guidelines in Oncology, Myeloid Growth Factors, Version 2.2016. See section entitled "NCCN Guidelines for Supportive Care" > "Myeloid Growth Factors". (Registration required.)

For Antimicrobial prophylaxis (no fever) with neutropenia:
- 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)** 500 mg PO/IV daily

**Anti-viral prophylaxis (neutropenia without fever)**

- **Acyclovir (Zovirax)** 400 mg PO q12h, or
- **Acyclovir (Zovirax)** 250 mg/m² IV q12h

**Anti-fungal prophylaxis (neutropenia without fever)**

- **Fluconazole (Diflucan)** 400 mg PO/IV daily – beginning when absolute neutrophil Count (ANC) becomes < 1000

  or

- **Posaconazole (Noxafil)** Extended release tablets – 300 mg – one tablet twice daily day 1, then one tablet daily thereafter. Suspension is 200 mg TID– beginning when Absolute Neutrophil Count (ANC) becomes < 1000.
For treatment of neutropenia AND fever (defined as T>38 °C while neutropenic)

**Anti-microbial work-up and therapy**

__ Blood cultures (frequency)  __ Urinalysis w/culture

__ Sputum culture + sensitivity  __ Chest x-ray

**Cefepime** *(Maxipime)* 2gm IV q 8h

**Vancomycin** *(Vancocin)* 1gm IV q 12h

Consider if: suspected catheter-related infection, skin or soft tissue infection, pneumonia or hemodynamic instability.

Consider trough level before 4th dose.

**Antifungal therapy**

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

**Voriconazole** *(Vfend)* 6mg/kg IV q12h for two doses, then 4 mg/kg IV q12h

Maintenance oral dose: Weight <40 kg: 100 mg PO every 12 hours

Weight ≥40 kg: 200 mg PO every 12 hours

**Caspofungin** *(Cancidas)* 70 mg IV once then 50 mg IV daily

**Liposomal amphotericin B** *(Ambisome)* 3 mg/kg/day IV over 1-4h

**Amphotericin B lipid complex** *(Abelcet)* 3 mg/kg/day IV over 1-4h

See REMM page about peer-reviewed [Fever and Neutropenia Guidelines](#)
NOTES

1. FDA approved for this indication

2. 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.

3. 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.
Body Chart for Recording Results of Radiation Survey and/or Burns