Guidelines for Identifying Radiation Injury and Considering Transfer to a Specialized Facility

1) **Purpose:** to provide hospitals with a concise guide for identifying casualties in the aftermath of a radiation incident who may have received a clinically significant dose of radiation.
2) **Regional RITN hospital contact information for specialized consultation:**
   Hospital Name:
   Department:
   Phone: Email:
3) **Overview:** Ionizing radiation affects the hematopoietic system even at very low doses; hematology and oncology medical staff treat these effects daily. Irradiated patients may develop severe organ dysfunction over time and require intense and specialized management.
4) **For extensive information on the acute radiation syndrome** (hematologic, gastrointestinal, cutaneous, central nervous system), types of radiation incidents, and radiation decontamination, see: www.remm.nlm.gov **(**Radiation Emergency Medical Management (REMM) website)
5) **CONSULTATION/REFERRAL CRITERIA:** Any patient suspected of having a radiation injury can be discussed with your local RITN center. The ability to accept referrals will depend on the size of the incident and the capacity of regional RITN center(s).
   a. **Criteria for considering RITN center consultation/referral include:**
      i. Absolute neutrophil count less than 1,000/µL
      ii. Absolute lymphocyte count less than 1,000/µL
      iii. Severe nausea, vomiting and/or anorexia
      iv. A localized cutaneous radiation injury that requiring extensive management
      v. Suspected or known internal contamination (*e.g.* involving a wound, the lung or GI tract)
      vi. Current facility not equipped to provide irradiated, leukoreduced blood products
   b. **Manage comorbidities and possible sequelae of irradiation:**
      i. See www.ritn.net/Treatment/ for acute radiation syndrome treatment guidelines:
         1. Transfuse only irradiated and leukocyte-depleted blood products
         2. Administer myeloid cytokines (*e.g.* G-CSF), if indicated.
         3. Provide infection prophylaxis and/or treatment, as indicated
         4. Maintain fluid, electrolyte and nutritional balance
      ii. Also see (REMM) website for *Prototype for Adult and Pediatric Medical Orders During a Radiation Incident* http://www.remm.nlm.gov/adultorderform.htm
   c. **Laboratory evaluation:**
      i. CBC with differential, absolute lymphocyte count (ALC) and absolute neutrophil count (ANC). If <48-72 hours since exposure, repeat q6 hours x 4, then q12 hours x 2, then daily.
      ii. Serum amylase (may be elevated at absorbed doses > 0.5 Gy)
      iii. Metabolic panel including electrolytes, renal and hepatic markers
      iv. PT/aPTT
   d. **Effects on Bone Marrow Function:**
      i. Decreased platelet count (<100,000) - clinical presentation includes bruising, petechiae, epistaxis, blood in urine or stool
      ii. Decreased white blood cell count (ALC<1,000/µL or ANC<1,000/µL) – clinical presentation includes fever and infection
      iii. Decreased red blood cell count (Hct < 30%) – clinical presentation includes pallor, fatigue, dyspnea with exertion

Hematopoietic (Bone Marrow) Acute Radiation Syndrome				
Dose* > 0.7 Gy (> 70 rads) (Mild symptoms may occur as low as 0.3 Gy or 30 rads)				
	Prodromal Stage	Latent Stage	Manifest Illness Stage	Recovery
Onset	• Onset occurs 1 hour to 2 days after exposure.			
Duration	• Stage lasts for minutes to days.	• Stage lasts 1 to 6 weeks.	• Most deaths occur within a few months after exposure.	• There should be full recovery for a large percentage of individuals from a few weeks up to two years after exposure.
Signs/ Symptoms	• Symptoms are anorexia, nausea and vomiting.	• Stem cells in bone marrow are dying, although patient may appear and feel well.	• Symptoms are anorexia, fever, and malaise. • Drop in all blood cell counts occurs for several weeks.	• In most cases, bone marrow cells will begin to repopulate the marrow.
General			• Survival decreases with increasing dose. • Primary cause of death is infection and hemorrhage.	• Death may occur in some individuals at 1.2 Gy (120 rads). • The LD50/60† is about 2.5 to 5 Gy (250 to 500 rads).
* The absorbed doses quoted here are "gamma equivalent" values. Neutrons or protons generally produce the same effects as gamma, beta, or X-rays but at lower doses. If the patient has been exposed to neutrons or				
† The LD50/60 is the dose necessary to kill 50% of the exposed population in 60 days.				

***Guidelines adapted from Dana-Farber Cancer Institute and Primary Children's Medical Center drafted documents