

Instructions on use of RADIATION CASUALTY ASSESSMENT TOOL

METER Course, v2.4 (5/09)

This information packet ('tool') is designed to help with the assessment and management of casualties of an incident involving radiation. Use one packet per casualty, labelling each page. It should become part of the permanent record for that casualty. You do not have to use those parts of the tool that do not apply to that casualty.

1. Triage Guide

STABILITY	Question 1: Is patient
	<input type="checkbox"/> "NO" then
	<input type="checkbox"/> "YES" then go to Question

- filled out by triage MD or RN
- used to establish initial priority (i.e. immediate treatment vs. immediate decontamination vs. delayed treatment and/or decontamination)
- designed to look and function like the SARS screening tool

2. History and Physical form (2 pages)

Name _____ Age _____ M/F
 Date _____ Time of Arrival _____
 Physician: _____ Time seen _____ h
 Mode of arrival: self EMS other

HISTORY AND I

Vitals: HR _____	BP _____ / _____	Temp _____ °C
RR _____	sats _____ % on _____	RA/T.p.m _____

- filled out by treating MD
- used to record findings on history and physical
- prompts physician to obtain specifics relevant to treatment and disposition decisions unique to radiation exposure and/or contamination
- includes biodosimetry estimates using three clinical measures

3. Body Mapping form for Skin Contamination and Injury

Name _____ Age _____ M/F
 Date _____ Time of Arrival _____
 Physician: _____ Time seen _____ h

BODY MAPPING

Injuries, burns, skin changes seconda	
Circle loc details be	

- filled out by treating MD or RN
- used to facilitate recording location of skin contamination
- contaminated areas are recorded (with initial count and description) as they are discovered by person performing survey. All contaminated areas must be decontaminated, with final counts recorded as well
- also used to record location of injuries

4. Standing Orders

ALLERGY ALERT

- No known drug allergy
 Known allergies: _____

DATE	TIME	
		<input type="checkbox"/> i.v.: <input type="checkbox"/> NS vs <input type="checkbox"/>

- filled out by treating MD
- prompts physician to order specific labs, specimens, and medications relevant to treatment of radiation exposure and/or contamination

5. Severity Scoring form (2 pages)

SEVERITY

Time of Exposure _____
 Time of Symptom Onset _____
 Time of Assessment _____

Used to inform: exposu

1. NEUROLOGICAL (Circle mos

Acute Symptom ²	1 (mild)	2 (moder
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- reference material for treating MD
- allows physician to estimate severity of injury due to radiation exposure when the exposure dose has not been determined. This may help with disposition decision
- lists some decorporating agents for internal contamination, table of 'time of onset of vomiting' as biodosimetry marker

Name _____ Age _____ M/F
 Date _____ Time of Arrival _____ h
 Triaged by: _____ Time seen _____ h
 Mode of arrival: self EMS ambulatory stretcher

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TRIAGE

STABILITY	Question 1: Is patient <u>medically stable</u>?	
	<input type="checkbox"/> “NO” then →	<ol style="list-style-type: none"> Cover with sheet, assume contaminated Move immediately to Contaminated Treatment Area
	<input type="checkbox"/> “YES” then go to Question 2	

CONTAMINATION	Question 2: Does patient have measurable skin <u>contamination</u> during 2 minute survey with Geiger Counter in triage?	
	<input type="checkbox"/> “YES” then →	<ol style="list-style-type: none"> Identify as contaminated (<i>i.e.</i> red bracelet) Record sites/activity of contamination (p 5) Prioritise for decon, move patient to decon site, then integrate into cohorted stream of uncontaminated ED patients Further assess for Exposure ASAP
	<input type="checkbox"/> “NO” then →	<ol style="list-style-type: none"> Identify patient as uncontaminated (<i>i.e.</i> green bracelet) go to Question 3

EXPOSURE	Question 3: Does patient have history, signs and symptoms of possible <u>exposure</u> to radiation?	
	<input type="checkbox"/> “YES”	<input type="checkbox"/> New onset of nausea, vomiting, diarrhea or skin changes? <input type="checkbox"/> New onset of weakness, confusion, unexplained low BP?
		<input type="checkbox"/> “NO”

RADIATION CASUALTY ASSESSMENT TOOL

*PLACE ID
STICKER HERE*

Name _____ Age _____ M/F
Date _____ Time of Arrival _____ h
Physician: _____ Time seen _____ h

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HISTORY AND PHYSICAL Form

Vitals: HR _____ BP _____ / _____ Temp _____ °C
RR _____ sats _____ % on _____ RA/Lpm

Chief complaint: _____
HPI: _____

Review of Systems (selected)

Neuro: Confusion Fatigue
Changes in: speech vision dizzy headache

Vomiting: yes or no # of times: _____
(began at _____ h, = _____ h after exposure)

Motor/sensory deficits? _____
Cognitive deficits? _____

Blood: Active bleeding?
Bruising Petechiae

Derm: Redness or Rash (Time of onset: _____ h)
Swelling Blisters Ulcers
Desquamation Hair loss Onycholysis
Dysaesthesia/pruritis

GI: Nausea (severity: _____/10) Anorexia
Abdominal pain Blood /mucus in stool
Diarrhea (began at _____ h; # of times: _____)
if female: LMP _____, Pregnant: yes/no/?

Details of radiation contamination/exposure: _____

Isotope known: _____ unknown
Type of particle: α β γ X-rays neutrons
State: solid/powder liquid gas/steam
Contamination see diagram
External contamination: yes no unknown
Extent of contamination (see diagram):
localised (skin/hair) Wound Generalised
Internal contamination: yes no unknown
Decontamination
Location: in field at ED , done by _____
Exposure yes no unknown
Time of exposure: _____ h, Duration: _____ h _____ min
Whole body Parts of Body _____

Past Medical History Immunosuppression
Cancer (radiation chemo , when? _____)
Previous fluoroscopy/Nuc Med testing/occupational exposure? _____
Other: _____
Medications (include dose & freq if known): _____

Allergies to meds: NKDA/ _____

Social history: _____

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Physician: _____ Time seen _____ h

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Physical exam: _____

Labs & Investigations:

Blood samples

- CBC: WBC _____ $\times 10^3$.
Abs Lymphocytes _____ Abs Neutrophils _____
Hgb _____ mg/dL, Plt _____ $\times 10^3$
- Chem 7: Na _____ Cl _____ K _____ CO₂ _____
BUN _____ Creat _____ Glc _____
- Pregnancy test (all females): neg/pos
- Thyroid: TSH, T3, free T4
- Cytogenetics (green-top tube; keep at room temp;
send ASAP) if exposure potentially > 0.5 Gray
- HLA typing (green-top tube; hold if potential for
requiring bone marrow transplant)

Specimens

(scan with Geiger Counter, then label & save)

- Nasal swabs (labeled L&R): activity: yes/no
- Mouth Swab: activity yes/no
- Urine sample: activity yes/no
- Stool sample: activity yes/no
- Emesis sample: activity yes/no

ECG: _____

imaging studies: _____

BIODOSIMETRY using different methods of estimating severity of exposure; use REMM Tool or tables p7-8 to calculate estimated dose (in Grays)

1. Time of onset of vomiting (see Table on page 8)

- Interval between exposure & onset vomiting: _____ h
- Estimated dose: _____ Gray

2. Absolute Lymphocyte depletion rate (use REMM)

- single ALC _____ $\times 10^3$, _____ hrs post-exposure
- serial ALC's: 2nd _____ $\times 10^3$, _____ hrs post-exposure
- Estimated dose: _____ Gray

3. Response Category: Neurological: 1 2 3 4
 Hematologic: 1 2 3 4
 Dermatological: 1 2 3 4
 Gastrointestinal: 1 2 3 4

OVERALL RESPONSE CATEGORY: 1 2 3 4

(Select highest value from 4 individual categories above)

Consistent biodosimetry estimate using all 3 methods is suggestive of radiation exposure at the indicated dose

(source: REMM , other: _____)

Resources (available 24/7 throughout Canada):

- Health Canada: (613) 954-6647
- Radiation Trauma Unit (UHN in Toronto):
(416) 603-5800 ext 5098
- REAC/TS: (865) 576-3131, www.remm.nlm.gov

Course in ED: _____

Reassessed: Time _____ h: _____

Diagnosis: 1) _____

2) _____ 3) _____

Decorporating agent considered: Yes No

Disposition: home , transfer (to: _____), admit

Follow-up: RTED if: _____

FP/ED in _____ days (pt aware)

outpt labs

Prescriptions _____

see RADIATION STANDING ORDERS

Signature: _____ time _____ h

see continuation sheet

RADIATION CASUALTY ASSESSMENT TOOL

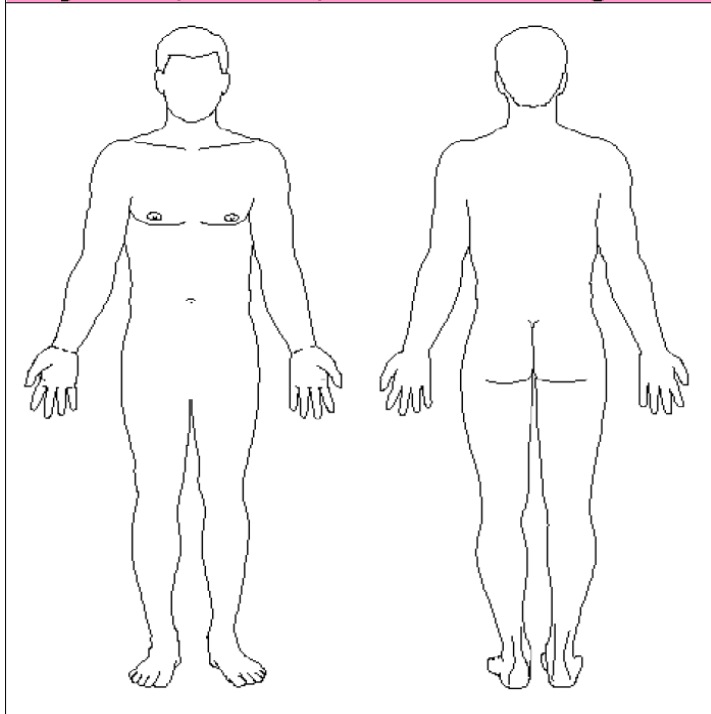
*PLACE ID
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BODY MAPPING Form

Injuries, burns, or skin changes

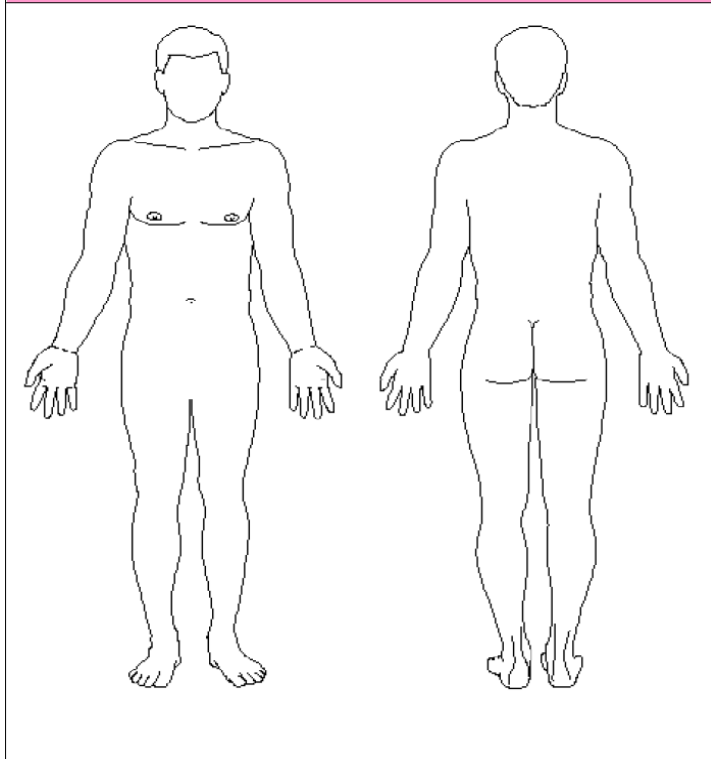


Circle location of injuries, number consecutively, list details

Site #	Details of Injury

Contamination

Initial survey done by _____ at _____ h Final survey done by _____ at _____ h
 Instrument: _____ Background counts per minute: _____



Circle location of contamination, then number consecutively. List details below. Be sure to survey nose, mouth, hands & feet. Readings should be in 'counts per minute' (CPM)

Site #	Description	Counts/min (initial)	Counts/min (final)

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PHYSICIANS ORDERS

ALLERGY ALERT

- No known drug allergy
- Known allergies: _____

DATE	TIME	<u>PHYSICIAN'S SIGNED ORDERS</u>	Initial
		<input type="checkbox"/> i.v.: <input type="checkbox"/> NS vs <input type="checkbox"/> other _____, initial bolus _____cc, then _____cc/hr	
		<input type="checkbox"/> O ₂ @ _____L/min by <input type="checkbox"/> NP <input type="checkbox"/> non-rebreather	
		Monitor: <input type="checkbox"/> cardiac <input type="checkbox"/> O ₂ sats	
		Labs: <input type="checkbox"/> CBC & manual diff q6hx4	
		<input type="checkbox"/> Lytes, BUN, creatinine, glucose	
		<input type="checkbox"/> Qualitative HCG (ICON)	
		<input type="checkbox"/> TSH, T3, free T4	
		<input type="checkbox"/> Tube for chromosomal analysis	
		<input type="checkbox"/> other:	
		Specimens (note: label specimen, test with Geiger Counter, then save)	
		<input type="checkbox"/> Nasal swab (L&R)	
		<input type="checkbox"/> Skin wipe	
		<input type="checkbox"/> Urine sample	
		<input type="checkbox"/> Stool sample	
		<input type="checkbox"/> Vomit sample	
		<input type="checkbox"/> other:	
		Medications	
		<input type="checkbox"/> Pain:	
		<input type="checkbox"/> Nausea/vomiting:	
		<input type="checkbox"/> Anti-diarrheal agent:	
		<input type="checkbox"/> Home Meds (<i>itemize home meds including dose/route/schedule on separate page</i>)	
		<input type="checkbox"/> Decorporating agent ¹ :	
		other:	
		<input type="checkbox"/> see additional order sheet	Signed: _____ MD

¹ See 'Severity Scoring Form', pages 7-8

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Physician: _____ Time seen _____ h

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SEVERITY SCORING Form

Time of Exposure _____
Time of Symptom Onset _____
Time of Assessment _____

Based on Waselenko JK *et al.* Ann Internal Med 2004;140(12):1037-1051,
also Fliedner TM *et al.* Oxford: British Institute of Radiology; 2001: 64pp
also refer to REMM website (www.remm.nhs.gov)

1. NEUROLOGICAL (Circle most appropriate description for each symptom)

Acute Symptom ²	1 (mild)	2 (moderate)	3 (severe)	4 (most severe)
Nausea	Mild	Moderate	Severe	Unbearable
Vomiting	~ 1 per day	~ 2-5 per day	~ 6-10 per day	> 10 per day
Anorexia	Mildly decreased appetite	Moderately decreased appetite	Severely decreased appetite	Unable to eat
Fatigue Syndrome	No functional impairment	Moderate functional impairment	Severe functional impairment	Unable to function
Fever	37.5-38 °C	38.1 - 40 °C	>40 °C for <24h	>40 °C for >24 h
Headache	Mild	Moderate	Severe	Unbearable
Hypotension	HR>100, BP>100/70	BP<100/70	BP <90/60 (transient)	BP <80/60 (persistent)
Neurological deficits	Minor deficit; no functional impairment	Moderate deficit; moderate functional impairment	Marked deficit; marked functional impairment	Severe deficit; loss of consciousness
Cognitive deficits	Mild cognitive impairment	Moderate cognitive impairment	Severe cognitive impairment	Profound cognitive impairment

2. HEMATOLOGIC (Circle most appropriate description for each symptom)

Acute Symptom ²	1 (mild)	2 (moderate)	3 (severe)	4 (most severe)
Abs Lymphocyte	$\geq 1.5 \times 10^9/l$	$1.0-1.5 \times 10^9/l$	$0.5-1.0 \times 10^9/l$	$<0.5 \times 10^9/l$
Abs Granulocyte	$\geq 2.0 \times 10^9/l$	$1.0-2.0 \times 10^9/l$	$0.5 - 1.0 \times 10^9/l$	$<0.5 \times 10^9/l$
Abs Platelet count	$\geq 100 \times 10^9/l$	$50-100 \times 10^9/l$	$20-50 \times 10^9/l$	$<20 \times 10^9/l$
Infection ³	Local; no antibiotics required	Local; topical or oral antibiotics	Systemic; oral antibiotics	Sepsis; i.v. antibiotics
Bleeding ³	Petechiae; easy bruising; normal Hgb	Mild blood loss; <10% decrease in Hgb	Gross blood loss; 10-20% decrease in Hgb	Spontaneous bleeding; >20% decrease in Hgb

Approximate equivalent exposure doses corresponding to different overall Response Categories:
1~ 1-2 Gy, 2~ 3-4 Gy, 3~ 6-7 Gy, and 4~ >8-10 Gy (note: high individual variability)

² Acute symptoms are those that began after the radiation exposure, and not thought to be attributable to another acute cause

³ Only present subacutely

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3. CUTANEOUS *(Circle most appropriate description for each symptom)*

Acute Symptom ²	1 (mild)	2 (moderate)	3 (severe)	4 (most severe)
Erythema	Minimal, transient	Moderate; isolated patches <10cm ² ; <10% of body surface area (BSA)	Marked; isolated patches or confluent; 10-40% BSA	Severe; isolated patches or confluent; erythroderma; >40% BSA
Sensation/ itching	Occasional pruritis	Slight; intermittent pain	Moderate; persistent pain	Severe; persistent pain
Swelling / Edema	Mild; asymptomatic	Moderate; symptomatic	Severe; symptomatic	Compartment syndrome
Blistering	Vesicles, with sterile fluid	Vesicles, with haemorrhage	Bullae, with sterile fluid	Bullae, with haemorrhage
Desquamation	Mild	Patchy, dry	Patchy, moist	Confluent, moist
Ulcer/ necrosis	Epidermal only	Dermal	Subcutaneous	Muscle / bone involvement
Hair loss³	Thinning, not striking	Patchy, visible	Extensive	Complete and most likely irreversible
Onycholysis³	Minimal	Moderate	Severe	Complete

4. GASTROINTESTINAL *(Circle most appropriate description for each symptom)*

Acute Symptom ²	1 (mild)	2 (moderate)	3 (severe)	4 (most severe)
Stool frequency	2 - 3 stools per day	4 - 6 stools per day	7 - 9 stools per day	>10 stools per day; intractable diarrhea
Mucosal loss with diarrhea	Rare	Intermittent, with moderate patches	Persistent, with larger patches	Continuous, with large patches
Bleeding with diarrhea	Occult	Intermittent	Persistent	Gross hemorrhage
Abdominal cramping & pain	Minimal	Tolerable	Intense	Excruciating

Decorporating agents (for use with internal contamination)⁴:

Cesium → Prussian Blue (1g in 200mL of water tid x 2-3 days)

Iodine → KI (note: dose of KI is age dependent; 50-130mg given po)

Plutonium, Americium → DTPA (given as Ca-DTPA initially, then Zn-DTPA)

Uranium → Sodium bicarbonate (250mL of 1.4% NaHCO₃)

Tritium → water (>6 litres/day)

Radium → Ca-gluconate (10mL of 20% solution bid)

Strontium → Barium sulphate (300g po single dose), Ca-gluconate

Other decorporating agents: Deferoxamine, Dimercaprol (BAL), and Penicillamine

Dose (Grays)	Onset of vomiting (hours after exposure)	duration
0.5-2.0	>6, or absent	<24 hours
2.0-3.5	2-6	12-24
3.5-5.5	1-2	24
>5.5	Minutes	48

Time interval prior to onset of vomiting for initial biodosimetry

² Acute symptoms are those that began after the radiation exposure, and not thought to be attributable to another acute cause

³ Only present subacutely

⁴ For prescribing information and other decorporating agents, refer to REMM; for local availability refer to Disaster Plan