Standard Operating Procedure

Radioisotope Spill Clean-up: Nuclear Medicine Radiation Safety

ABCD-21-16-90035

Site Applicability

This SOP is applicable to all Nuclear Medicine (NM) departments within Fraser Health (FH), Providence Health Care (PHC), Provincial Health Services Authority (PHSA) and Vancouver Coastal Health (VCH).

Purpose

This procedure outlines the immediate steps following a radioactive spill event to ensure clean-up is performed in a safe manner minimizing the impacts to facilities, contaminated individuals, staff, public, and the surrounding environment.

Scope

This Standard Operating Procedure is to be followed by all Lower Mainland Medical Imaging (LMMI) Nuclear Medicine departments within Fraser Health Authority (FHA), Providence Health Care (PHC), Provincial Health Services Authority (PHSA) and Vancouver Coastal Health (VCH). Spill clean-up personnel must be conducted by trained personnel.

This procedure applies to any size/activity spill within capacity of the department for clean-up. If spill size/activity is beyond capacity of the department call the 24-hour emergency response number (1-833-343-4784).

Sites where I-125 and/or I-131 are utilized must have spill-response personnel respirator fit-tested every 12 months.

Additional information regarding personnel decontamination can be found in the SOP for Personnel Decontamination.

Responsibilities

If a worker/patient is injured, proceed immediately with first aid procedures. Life-saving operations should not be prevented or delayed due to radiation exposure considerations. Pregnant women cannot participate in spill clean-ups involving I-125 and I-131.

Supplies and Equipment

Spill/Decontamination Kit

Supplies	PPE
▪ Tripads, paper towels, absorbent materials ▪ Soap or decontamination solution (e.g. Radiacwash, Bind-it) ▪ Marker/felt pen/pen ▪ Plastic garbage bags ▪ Clean scrubs ▪ Shampoo ▪ Hair nets ▪ Q-tips ▪ Tongs/forceps ▪ Radioactive barrier tape ▪ RS Reporting Form	▪ Disposable nitrile gloves with extended cuff recommended ▪ Disposable fluid impermeable shoe covers/booties ▪ Fluid impermeable gowns ▪ Disposable face shield ▪ Respirator with Iodine cartridges **Not in spill kit:** ▪ Lead Apron (recommended for I-123 and Tc-99m only)

Additional Equipment

- Berthold contamination monitor (in Bq/cm^2 setting) or pancake contamination monitor (in cps/cpm setting) – refer to site-specific monitor requirements
- Survey meter (µSv/hr)
- Dosimeter (personal or electronic)

Spill Clean-up Procedure

1. Immediate Response

As per the Incident Command Process, any injured personnel should seek first aid assistance immediately. Personnel in the immediate area should be notified of the spill and warning signs should be placed in the area to prevent further contamination. Call for additional assistance as applicable, including notification of the Site RSO(SRSO). Care must be taken to ensure further contamination is minimized.

2. Personnel Decontamination

Personnel decontamination takes precedent over spill clean-up and must not be delayed to conduct spill clean-up activities.

If personnel are suspected to be contaminated, follow the Personnel Decontamination SOP. Notify the Site RSO.

3. Don personal protective equipment (PPE):

Don PPE in an area away from the spill:

a. Double gloves - extended cuff underneath gown, regular cuff over gown
b. Impermeable gown
c. Disposable impermeable booties
d. For I-131, I-125 spills only: a respirator with iodine cartridges (remember to conduct a seal check!)

4. Perform instrument check

Using Page 2 of the RS Report Form:

a. Record the instruments being used
b. Perform battery check.
c. Select Bq/cm^2 count rate for contamination monitor and µSv/h for survey monitor
d. Record background

5. Clean-up Spill

ⓘ *Replace contaminated PPE as needed throughout clean-up process to prevent the spread of contamination*

ⓘ *Instruct radioactive patients to leave area as applicable to allow for accurate assessment*

a. Prepare garbage bag(s) for contaminated waste and linen.
b. Wipe up the spill with the absorbent material. Minimize spread of the spill by wiping from the outside to the inside of the spill area. Use detergent, if necessary.
c. Perform contamination monitoring of the area for residual contamination. Record results on the RS Report Form.
d. Repeat the steps ‘b’ to ‘d’ if contamination is still present above the limits in Table 1 of this procedure.

6. Spill Clean-up Ends

a. The clean-up steps end when contamination results are no longer decreasing.
b. If contamination results remain above the area limits (Bq/cm^2) in Table 1:
   i. Cover the area with tripads (e.g., floor, equipment, hand rails, edge of treadmill, surrounding floor).
   ii. Perform a wipe test to determine how much of the contamination is fixed or removable. Record results on the RS Report Form.
c. Perform a survey measurement to determine if it exceeds the applicable survey limits in Table 1 of this procedure.
d. Where either contamination or survey results are above the applicable limits for public or controlled areas in Table 1, close the area as per Step 9 (for treadmill procedures refer to Step 9c).

Table 1: Contamination and Survey Limits

Classification of Radioisotope	Public Area Limits		Controlled Area Limits	
	Removable Contamination (Bq/cm^2)	Survey (µSv/hr)*	Removable Contamination (Bq/cm^2)	Survey (µSv/hr)*
Class A Isotopes long-lived α emitters and their daughters	0.3	2.5	3	No limit
Class B Isotopes I-131, Sr-90, Re-188, Y-90, Ra-223	3	2.5	30	No limit
Class C Isotopes C-14, Co-57, Ga-67, I-123, In-111, Tc-99m	30	2.5	300	No limit

*Measured at 0.5m from the spill area

7. Remove PPE

a. Remove booties, outer gloves, disposable gown and inner gloves then discard in contaminated waste.
b. If using a respirator:
   i. Don clean gloves.
   ii. Remove respirator.
   iii. Remove cartridges from the respirator and discard in contaminated waste.
   iv. Put respirator aside for cleaning and disinfecting before storage.
   v. Remove gloves.

8. Monitor for Personnel Contamination after spill clean-up

a. Monitor all affected personnel for contamination and record results on the Report Form: NM Radiation Safety.
b. If contamination is identified ask for assistance to follow the steps in the Personnel Decontamination SOP and notify SRSO. Take care not to spread contamination.

9. Closing/Opening an Area

a. In a Treadmill/Treadmill area

If contamination levels exceed the limits in Table 1 for a public area, you can continue the activity for MPI patients only. Perform the following steps:

i. Ensure contamination is contained within the Stress lab area. This can be done by monitoring staff's shoes prior to leaving the Stress Lab or by requiring mandatory booties while in the area and removing them safely when leaving the area. Record the containment steps and any readings in the Incident description section of the RS Report Form.

ii. When MPI tests are completed return to Step 9b to close/open area for public.

b. In a Public Area

If the removable contamination or survey levels from the spill area exceed the limits in Table 1, perform the following steps to determine the size of the closed area:

i. Where possible, place enough lead shielding on the spill area to bring survey readings below 2.5 µSV/hr at 0.5 m from the spill area

ii. Close the area surrounding the spill:
- Place caution tape around the area (treadmill, portion of room, entire room).
- Ensure the survey readings outside the closed area are less than 2.5µSv/hr. Record results on the RS Report Form.
- If survey readings outside the closed area are more than 2.5µSv/hr, use additional lead shielding or expand the closed area until the levels are met and record results.
- Post Radioactive Spill Warning Sign on caution tape and at all points of access if entire room is closed.

iii. Communicate access restrictions to all parties who may need access to the closed area (these may include: Cardiology, Housekeeping, Security, FMO).
- Grant access to the public to the rest of the areas where the dose rate is less than 2.5µSv/h.

iv. Estimate time to return for follow-up monitoring based on isotope half-life. Record time on the Report Form: NM Radiation Safety.

v. Open the area when removable contamination and survey levels are below the limits in Table 1. Record final results on the Report Form: NM Radiation Safety: .
- Remove caution tape and signage.
- Communicate end of access restrictions to all parties previously notified of closure.

c. In a Controlled Area

If contamination levels exceed the limits in Table 1 for a controlled area, the area must be closed to all workers (except NM Technologists).

i. Where possible, place shielding on spill area to reduce survey readings as much as reasonably achievable, while allowing safe passage and work to continue. Record survey results with shielding in place on the Report Form: NM Radiation Safety.

ii. Place caution tape around the contaminated area.

iii. Post Radioactive Spill Warning Sign on caution tape.

iv. Communicate access restrictions to all parties who may need access to the closed area (these may include: Cardiology, Housekeeping, Security, FMO).

v. Estimate time to return for follow-up monitoring based on isotope half-life. Record time on the RS Report Form.

vi. Open the area when contamination levels (Bq/cm^2) are below the limits for controlled areas in Table 1. Record final results on the Report Form: NM Radiation Safety.
- Remove caution tape and signage.
- Communicate end of access restrictions to all parties previously notified of closure.

10. Waste management

a. Put on a clean pair of gloves.
b. Handle all waste as per site procedure.

11. Documenting and Reporting

Use the Report Form: NM Radiation Safety to complete documentation of the spill and any personnel contamination and provide to SRSO.

The Site RSO will determine if the incident is a minor or major spill. If it is a major spill, the Site RSO will immediately report the incident to the Regional RSO.

12. Arrange for any necessary thyroid monitoring

The SRSO will determine which personnel involved in the spill clean-up efforts must receive thyroid monitoring.

13. Incident Follow-up

The SRSO, RRSO and Workplace Health will facilitate any investigation and submission of reports to the CNSC and/or WorkSafeBC as needed.
Note: An immediate report to CNSC must be submitted by the RRSO in the case of a major spill (see Radiation Safety Manual) or if the skin doses are found to be as follows:

- If a Nuclear Energy Worker (NEW) was calculated to have received a skin dose above 50mSv.
- If a non-NEW was calculated to have received a skin dose above 5mSv.

14. Restock decontamination supplies and equipment as necessary

Replenish any supplies/equipment.

References/Associated Documents:

- Report Form: NM Radiation Safety
- Radioactive Spill Warning Sign
- Incident Command Process
- Personnel Decontamination SOP

Appendices

- Appendix A: Radioactive Spill Warning Sign

Appendix A: Radioactive Spill Warning Sign

NO ACCESS BEYOND THIS POINT

NO PRECAUTIONS REQUIRED OUTSIDE THE CLOSED AREA

Nuclear Medicine

Radiation Safety Emergency Contact Information:

Name	Phone Number
Nuclear Medicine Supervisor/Site Radiation Safety Officer (daytime)	
24-hour Emergency Contact Radiation Safety Officer on call	**1-833-343-4784**

**This sign may only be removed by Nuclear Medicine*

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	1.0	30-JUN-2019	Initial Release	Roxana Ralea - RRSO Marjorie Gonzalez – RRSO Rhonda Hollerbaum - RPL Micah Ho - WPH Jackie Ellis - WPH
	2.0	31-DEC-2019	Re-organized the sections for a better flow, replaced Radioactive Spill and Contamination Report with RS Report Form.	Roxana Ralea - RRSO Marjorie Gonzalez – RRSO Rhonda Hollerbaum - RPL Micah Ho - WPH Jackie Ellis – WPH