SESLHD PROCEDURE COVER SHEET

NAME OF DOCUMENT	Radiation Safety - Storage and Disposal of Radioactive Waste
TYPE OF DOCUMENT	Procedure
DOCUMENT NUMBER	SESLHDPR/544
DATE OF PUBLICATION	April 2024
RISK RATING	Medium
LEVEL OF EVIDENCE	National Safety and Quality Health Service Standards: Standard 1 – Clinical Governance
REVIEW DATE	April 2027
FORMER REFERENCE(S)	SESLHNPD/63 Radiation Safety – Storage and Disposal of Radioactive Waste
EXECUTIVE SPONSOR	Executive Director Operations
AUTHOR	Brent Rogers, SESLHD Radiation Safety Officer Erin McKay, RSO St George Hospital
POSITION RESPONSIBLE FOR THE DOCUMENT	District Radiation Safety Officer SESLHD-RadiationSafetyOfficer@health.nsw.gov.au
FUNCTIONAL GROUP(S)	Radiation Safety
KEY TERMS	Radiation safety, ionising radiation, radioactivity, radioactive waste
SUMMARY	Procedures for the safe storage and disposal of radioactive waste

Radiation Safety - Storage and Disposal of Radioactive Waste

SESLHDPR/544

1. POLICY STATEMENT

South Eastern Sydney Local Health District (SESLHD or the LHD) is committed, through a risk management approach, to protecting employees, contractors, students, volunteers, patients, members of the public and the environment from unnecessary exposure to radiation arising from systems and processes which use radiation apparatus and radioactive substances, whilst maintaining optimum diagnostic and therapeutic quality, therapeutic efficacy and patient care.

This document provides the procedures necessary to ensure compliance with this policy in relation to the management of radioactive waste produced by diagnostic, therapeutic or research activities.

2. BACKGROUND

Nuclear medicine procedures and certain laboratory assays will result in small quantities of radioactive waste. Brachytherapy procedures utilising radioactive seeds will also result in unused seeds. This procedure describes appropriate methods for the storage and eventual disposal of this waste radioactive material.

Note: this document does not relate to additional security arrangements and procedures related to category I, II and III sealed sources as defined in Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) RPS 11 Code of Practice for the Security of Radioactive Sources (2019). There is a separate procedure document (SESLHDPD/149 – Radiation Safety – Security of Radioactive Sources) which deals specifically with these “enhanced security” sources.

Note: this document specifically excludes patient excreta in any form as a source of radioactive waste.

3. RESPONSIBILITIES

3.1 Department Managers:

Department Managers of centres that store and dispose of radioactive waste are responsible for ensuring compliance with this Procedure.

4. PROCEDURE

4.1 Storage Procedures (identification, location, record keeping, etc.)

Radioactive substances must be stored in appropriately shielded and labelled containers in an area of low occupation. They must be clearly identified with a black on yellow trefoil, the radioisotope, activity (in Bq), or the dose rate in uSv per hour at the surface of the package, and the date in which the listed activity was assayed. In the event that aliquots of unsealed sources are removed for use, the identification must be updated immediately.

Radioactive sources that are not required for immediate use must be securely stored. The occupier must ensure that:

- A store or storage area for radioactive sources within the premises is constructed of durable materials, is lockable and secure
- Radioactive sources are not stored with explosive, combustible or corrosive material
- The radiation level in any accessible region outside the store or storage area does not cause the dose limits in Schedule 5 of the *Protection from Harmful Radiation Regulation 2013* (NSW) to be exceeded. That is, 1mSv per year for a member of the public and 20mSv per year for occupationally exposed persons.

Sealed sources and premises, which are registered with the EPA, must meet the conditions of their registration, in addition to the requirements of this procedure.

Radioactive waste must be stored in a secure (durably locked) location, taking into account ALARA (as low as reasonably achievable) principles for radiation exposure. Wastes should be segregated based on its physical form (solid, liquid or gas) and with isotopes of similar half-life. Waste bins must be sufficient to prevent the spread of contamination by leaking, leaching or airborne means.

Any syringe that has been used to administer a radiopharmaceutical or which may be contaminated with radioactivity for any other reason MUST be disposed of into a SHIELDED sharps container. The sharps containers must not be overfilled. Personal protective equipment (PPE), appropriate to the hazard must also be worn when handling waste. Lab-coats, gloves and overshoes are examples of PPE that may be required during waste-handling procedures.

All stored waste packages must be clearly labelled with

- Radionuclide
- Date of storage (or closure of sharps bin)
- Expected date of disposal.

Typically, for nuclear medicine and laboratory waste, the “Delay and Decay” method is practiced. All waste for hospital disposal must be kept for the required time period and monitored prior to disposal. Typically, radioactive waste should be stored for at least 10 halflives.

ALL WASTE FOR HOSPITAL DISPOSAL MUST BE MONITORED AND MUST NOT READ ABOVE BACKGROUND. This ensures that no radioactive waste leaves the Nuclear Medicine department. There is a “sign in” and “sign out” register for long term waste.

4.2 Reporting procedures in the event of the loss of a radioactive source

In the event that a radioactive source has been involved in an incident which includes, detectable theft, unexplained loss, unauthorised damage, unauthorised access; or unauthorised transfer, the departmental manager of the site must ensure that this is reported to:

The appropriate hospital Radiation Safety Officer, who will report to:

- the hospital General Manager
- the Chief Executive of the NSW Environment Protection Authority (EPA) (via the Radiation Control Section of the EPA) within two days of the person becomes aware of the loss or theft
- the Police (if a criminal act, such as theft, is suspected).

Detailed information about the source and the circumstances of the loss should be provided, including:

- circumstances surrounding the loss.
- steps taken or proposed to be taken to recover the radioactive source.
- any information that may assist in the recovery of the source.

A follow-up written report must be submitted to the EPA within seven days of the original notification, containing all of the information above and any information that has been updated since the original notification.

4.3 Mixed waste hazards

Mixed waste is defined as a waste that is both radioactive and contains a non-radioactive contaminant that is itself considered a hazardous material, such as biological waste. Such wastes are subject to regulation for both hazards, which adds to their complexity when dealing with them. For this reason, mixed wastes should be avoided.

In the event one is confronted with mixed waste, the protection scheme employed to deal with it must include protection from all of the hazards. Additionally, stores utilised for radioactive materials must not be co-located with combustibles.

4.4 Conditioning/packaging and storage of radioactive waste

Refer to Annex E of the ARPANSA Safety Guide entitled Predisposal Management of Radioactive Wastes (RPS-16) for management of medical and laboratory radioactive waste.

4.5 Disposal procedures (when, how, who authorises the disposal, etc.)

Procedures must be developed by each department for disposing of radioactive waste. These procedures must take into account the necessity to manage radioactive wastes in such a way that the exposure of staff and the general public to radiation is as low as reasonably achievable below prescribed limits. Radioactive waste may present a range of external radiation hazards depending on the activity and emissions and may, if ingested or inhaled, present a variety of internal radiation hazards to the human body dependent upon the radionuclide and its chemical and physical form.

The type of waste generated can take the following forms:

- airborne wastes such as radioactive gases, vapours, or particulate material
- liquid radioactive wastes: these include patient excreta and aqueous solutions of radionuclides or suspensions of radioactive material in water or water-miscible liquid(s). Another category of liquid wastes is that of organic solvents which, because they are flammable or toxic, usually require special methods of disposal such as incineration in an approved incinerator
- solid wastes include liquid in solid containers, sealed sources and rubbish. Sealed sources are generally in the form in which they were originally purchased; whilst rubbish includes contaminated packing materials, laboratory glassware, pipette tips, plastic vials and trays, paper tissues, used syringes, etc.
- radioactive animal carcasses (from research activities) need special consideration. Carcasses of small animals such as mice and rats, and excised organs of larger animals, may be macerated and treated as liquid waste, or disposed of in a tip as solid waste or incinerated. The nature and quantity of radioactivity involved should be taken into account in selecting the appropriate option. Larger animals are not normally sacrificed as part of studies in which radioactive material is administered. However, should a large animal die whilst contaminated with radioactive material, the animal should be incinerated or buried as solid waste.

4.5.1 Disposal Authorisation

Before radioactive waste can be disposed of, the appropriate authorisation must be obtained from the EPA. The waste management plan should consider all forms of waste - sealed sources, and unsealed sources in solid, liquid or airborne form. The plan should also take account of mixed waste hazards, eg, if the waste is also flammable, toxic, infectious or putrescible.

4.5.2 Minimisation, segregation and disposal

The effective management of low and intermediate level waste depends on knowledge of the waste characteristics and the contained radioactivity. The volume of radioactive waste should be kept to a minimum and should be categorised according to its method of disposal at as early a stage as possible. Non-radioactive waste and very low level waste (that is, below the exemption levels set by the regulatory authority) should be kept separate from waste that needs to be disposed of as radioactive waste. This waste should be monitored to confirm its status before being removed from a controlled area. It is useful to segregate radioactive waste on the basis of half-life in order to facilitate appropriate storage and disposal. For example, waste can be segregated into short-lived and long-lived radionuclide bins. The bins should be well shielded and the content disposed of when the activity drops to a sufficiently low level such that it is indistinguishable from background when measured with an area radiation monitor. Care must be taken to remove or deface any indications that the disposed waste is radioactive.

If possible, sealed sources should be returned to the supplier when no longer required. Prior to purchasing a sealed source, purchase contracts should include the provision that the manufacturer will accept return of the source at the end of its useful life.

4.5.3 *Additional guidance, given in "National directory for radiation protection" Schedule 1 of RPS C6, table S.1.1, "landfill package activity through its discharge and are discharge values for periodic disposal very low level radioactive material" may also be useful.*

No authorisation is required from the regulatory authority to dispose of radioactive material provided that

- *the radioactivity does not exceed the values published in the table*
- *it is recorded in the register that is kept by the person initiating the disposal.*

5. DOCUMENTATION

- SESLHD Radiation Management Licence
- Radiation Waste Management Plan
- Radiation Source Security Plan

6. AUDIT

The following records should be available for audit:

- Registers of radioactive substances
- Waste storage and disposal records
- EPA Authorisations for Waste Disposal

7. REFERENCES

[1] SESLHDPD/296 - Radiation Safety - Ionising Radiation Safety
[2] *Protection from Harmful Radiation Regulation 2013* (NSW)
[3] ARPANSA RPS-11 Code of Practice for the Security of Radioactive Sources (2019)
[4] ARPANSA RPS-16 Predisposal Management of Radioactive Wastes (2008)
[5] ARPANSA RPS C-6 Code for Disposal of Radioactive Waste by the User (2018)

8. VERSION AND APPROVAL HISTORY

Date	Version	Version and approval notes
Aug 2010	Draft	Brent Rogers, RSO NHN
Nov 2010	Revised Draft	Richard Smart, RSO
Feb 2011	0	Approved by Combined Clinical Council
September 2016	1	Review Tool – endorsed by Executive Sponsor
November 2016	1	Review undertaken and updates approved by Executive Sponsor
December 2019	2	Review undertaken and updates approved by Executive Sponsor
26 April 2024	3.0	Major review: updated reference to ARPANSA C1 and C5. Approved by SESLHD Clinical and Quality Council.