

# SESLHD PROCEDURE COVER SHEET



**Health**  
South Eastern Sydney  
Local Health District

<b>NAME OF DOCUMENT</b>	Radiation Safety - Protection of Staff in Operating Theatres
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<b>AUTHOR</b>	SESLHD Radiation Safety Officer
<b>POSITION RESPONSIBLE FOR THE DOCUMENT</b>	SESLHD Radiation Safety Officer <a href="mailto:SESLHD-RadiationSafetyOfficer@health.nsw.gov.au">SESLHD-RadiationSafetyOfficer@health.nsw.gov.au</a>
<b>FUNCTIONAL GROUP(S)</b>	Radiation Safety
<b>KEY TERMS</b>	Radiation safety; ionising radiation; x-rays; radioactive substances; PPE; lead aprons; protective clothing; brachytherapy
<b>SUMMARY</b>	Procedure to limit the risk to health of staff arising from exposure to radiation from fixed and mobile fluoroscopic examinations, from nuclear medicine procedures or during brachytherapy procedures in the Operating Theatres.

## **COMPLIANCE WITH THIS DOCUMENT IS MANDATORY**

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## 1. POLICY STATEMENT

South Eastern Sydney Local Health District (SESLHD) 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 procedures necessary to ensure compliance in relation to the protection of staff in operating theatres where mobile fluoroscopic screening is used or where radioactive substances are used.

## 2. BACKGROUND

Staff involved in X-ray or fluoroscopic procedures could receive a radiation exposure from scattered radiation from the patient being examined. In normal circumstances no one, other than the patient, should be exposed to the primary x-ray beam, but such exposure could occur unintentionally.

Staff attending to patients who are either receiving therapy using radioactive materials or contain radioactivity from a previous diagnostic procedure could be exposed to gamma radiation from the patient being treated.

## 3. RESPONSIBILITIES

### 3.1 The Surgeon or interventionalist

The Surgeon is responsible for the clinical management of the patient undergoing an intra-operative diagnostic or therapeutic radiation procedure. This includes minimising the fluoroscopy time as far as is consistent with achieving the best outcome for the patient. The radiation dose received by the patient is directly proportional to the fluoroscopy time, as is the amount of scattered radiation produced during the procedure.

### 3.2 The Radiographer

The radiographer is responsible for performing the fluoroscopic procedures in accordance with the centre's written standard protocols. This will include:

- following imaging protocols to ensure optimal data acquisition and analysis;
- performing quality assurance procedures for instrumentation and image quality; and
- minimising radiation exposure of theatre staff during the procedure.

### 3.3 The Radiation Safety Officer (RSO)

The Radiation Safety Officer will:

- oversee and provide advice on radiation safety within departments performing diagnostic or interventional radiology;
- provide risk assessments for theatre staff working with radioactive patients.

### 3.4 The Nursing Unit Manager

The Nursing Unit Manager must ensure that all theatre staff who are occupationally exposed to ionising radiation:

- are issued with personal radiation dosimeters as described in SESLHDPR/543 - Personal Monitoring;
- have access to X-Ray PPE as described in [SESLHDPR/732 - X-Ray Protective Apparel](#);
- are scheduled to complete radiation safety training as described in [SESLHDPR/537 - Radiation Safety Training](#); and
- are aware of, and comply with, these procedures.

### 3.5 Operating Theatre Staff

Operating theatre staff, including Medical Officers, must:

- be aware of, and comply with, these procedures;
- complete any required radiation safety training; and
- wear any radiation monitors and X-ray PPE issued to them during x-ray procedures.

## 4. PROCEDURE

### 4.1 Procedures to minimise radiation exposure during fluoroscopic procedures

The precautions to be used in the operating theatres during x-ray procedures are the same as in other areas using x-rays, namely:

- Wear a lead or lead equivalent gown of appropriate thickness while in theatre when x-rays are being used (see [SESLHDPR/732 - Radiation Safety – X-Ray Protective Clothing](#)).
- If a lead gown cannot be worn then stand behind a mobile lead screen;
- Never place any part of the body in the x-ray beam; and
- Stand as far back from the patient as possible to minimise exposure to scattered radiation.

Be aware that when the x-ray beam is pointing horizontally (i.e. taking a lateral image of the patient) the scattered radiation from the patient can be as much as a factor of ten higher on the beam-entrance side of the patient. Stand on the Image Intensifier side of the patient, rather than on the side with the x-ray tube, to minimise exposure.

#### 4.1.1 Personal protective equipment

X-ray protective apparel should conform to the requirements of NSW EPA Radiation Standard 4 Compliance requirements for x-ray protective clothing. For high dose rate procedures (e.g. interventional cardiology) 0.5 mm lead equivalence is recommended for the front panel.

A Medical Physicist, Radiation Safety Officer or Senior Radiographer must be consulted before the purchase of x-ray protective equipment and apparel, to ensure that what is

selected is appropriate to the task and level of risk. The equipment must undergo acceptance testing prior to use, to ensure that it provides the required level of protection.

All personal protective clothing used in the facility should be clearly labelled with its lead equivalence and a unique identification number as described in [SESLHDPR/732](#). If damage to an apron is seen or suspected, it must be reported to the chief radiographer and/or the Radiation Safety Officer immediately and the apron removed from service until its shielding integrity can be checked.

## **4.2 Procedures using radioactive substances**

### **4.2.1 Sentinel Node Biopsy**

The Sentinel Node is the first lymph node to receive drainage from a primary tumour. Lymphatic mapping using Technetium-99m colloid allows the primary (or Sentinel) node and other nodes which have taken up the radioactive substance to be identified and biopsied thus reducing the need for axillary clearance associated with breast cancer.

As extremely low activities of Technetium-99m are used, staff do not need to wear lead aprons. Tissue samples sent for pathology tests may be handled in the usual manner.

### **4.2.2 Permanent Seed Prostate Brachytherapy**

- Permanent seed prostate brachytherapy implantation is carried out under general or spinal anaesthesia.
- Approximately 80 – 120 Iodine-125 seeds, each with activity in the order of 15 MBq per seed are implanted transperineally into the prostate under ultrasound and fluoroscopy guidance. These seeds come pre-loaded into sterile needles from the manufacturer, although in some circumstances, re-loading of some seeds may be required in the operating theatre to adapt to the patient’s anatomy on the day.
- As the fluoroscopy unit is in regular use throughout the procedure, all staff present in the operating theatre must be protected by appropriate lead apparel or screens. They must also be wearing their personal radiation dosimeter.
- The radiation oncologist or urologist performing the implant must also wear ring monitors to assess the radiation dose to their fingers, and lead glasses are recommended for eye protection.
- At the completion of the implant, there are routinely several seeds that are not implanted into the patient. The Radiotherapy Physicist will collect these seeds in a lead pot and transfer them to the appropriate storage lead pot, updating the inventory for the isotope store.
- Prior to any staff member or equipment leaving the operating theatre, the Radiotherapy Physicist will use an appropriate radiation survey meter to complete a scan of the seed trolley and surrounding area, looking for any dropped seeds. Any seeds found will be documented and stored with the other unused seeds.
- At the end of the procedure the physicist will attach a yellow wrist band to the patient indicating that the patient is radioactive. This wrist band will remain on the patient until discharged from hospital.

### 4.3 Pregnant Staff

If an occupationally exposed staff member is pregnant then the foetus should be afforded the same level of protection as a member of the public. This may be achieved by controlling the exposure of the employee such that the dose received by the foetus is less than the public effective dose limit of 1 mSv for the remainder of the pregnancy.

The likely dose to the foetus of a pregnant employee from each work activity should be assessed. This will usually require an examination of the employee's personal monitoring records and an assessment of the likelihood of incidents leading to either external or internal exposure of the foetus.

If the foetus could receive more than 1 mSv over the declared term of the pregnancy a change in work practice should be discussed and agreed to with the employee. An occupationally exposed pregnant staff member can be provided with second radiation badge to monitor the foetal dose from external radiation sources ([SESLHDPR/543](#)).

## 5. DOCUMENTATION

- Standard Operating Procedures (SOPs) for diagnostic x-ray and fluoroscopic procedures
- SOPs for low dose rate implant therapy

## 6. AUDIT

The following documentation should be available for audit:

- Staff radiation dose records
- Compliance certificates for radiographic apparatus
- Annual lead apron testing records showing the identification number, usual location, date of purchase, lead equivalence, style, testing dates and test results
- Permanent Prostate Seed Brachytherapy Record sheets

## 7. REFERENCES

- [1] ARPANSA RPS C-1 (2020) Code for Radiation Protection in Medical Exposure
- [2] ARPANSA RPS C-5 (2019) Code for Radiation Protection in Medical Exposure
- [3] ARPANSA RPS 14.1 (2008) The Safety Guide for Radiation Protection in Diagnostic and Interventional Radiology
- [4] ARPANSA RPS 14.2 (2008) The Safety Guide for Radiation Protection in Nuclear Medicine (RPS14.2)
- [5] ARPANSA RPS 14.3 (2008) The Safety Guide for Radiation Protection in Radiotherapy
- [6] NSW Environment Protection Authority (2023) Radiation Standard 4 - Compliance requirements for x-ray protective clothing.
- [7] SESLHDPR/732 - Radiation Safety - X-Ray Protective Clothing

**8. VERSION AND APPROVAL HISTORY**

<b>Date</b>	<b>Version</b>	<b>Version and approval notes</b>
June 2010	Draft	Richard Smart, Area Radiation Safety Officer in conjunction with the Area Radiation Safety Committee
February 2011	0	Approved by Combined Clinical Council
January 2016	1	Periodic Review
October 2016	1	Updates endorsed by Executive Sponsor
20 May 2024	2.0	Major review: added requirements of ARPANSA Documents C1 and C5; updated new requirements of personal shielding from EPA Standard. Approved by SESLHD Clinical and Quality Council.