SESLHD PROCEDURE COVER SHEET

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EXECUTIVE SPONSOR or EXECUTIVE CLINICAL SPONSOR	Caroline Skipper Director People and Culture
AUTHOR	Brent Rogers, SESLHD Radiation Safety Officer Erin McKay, RSL SESLHD Southern Sector
POSITION RESPONSIBLE FOR THE DOCUMENT *including email address*	District Radiation Safety Officer SESLHD-RadiationSafetyOfficer@health.nsw.gov.au
KEY TERMS	Radiation safety; ionising radiation; x-rays; radioactive substances; PPE; lead aprons; protective clothing; brachytherapy
SUMMARY *Brief summary of the contents of the document*	Procedure to limit the risk to health of staff arising from exposure to radiation from mobile fluoroscopic examinations, from nuclear medicine procedures or during brachytherapy procedures in the Operating Theatres.

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 mobile 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

- is responsible for the clinical management of the patient undergoing an intra-operative diagnostic or therapeutic radiation procedure. This includes minimising the fluoroscopy time. The radiation dose received by the patient is directly proportional to the fluoroscopy time.

3.2 The Radiographer

- The radiographer is responsible for performing the mobile 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
  - ensuring that no staff member receives a radiation exposure.

3.3 The Radiation Safety Officer (RSO)

- will oversee and provide advice on radiation safety within departments performing diagnostic or interventional radiology.

3.4 The Nursing Unit Manager

- must ensure that all theatre staff are aware of, and comply with, these procedures.

3.5 Operating Theatre Staff

- must be are aware of, and comply with, these procedures
- must wear any radiation monitors issued to them.

4. PROCEDURE

4.1 Procedures to minimise radiation exposure during fluoroscopic procedures

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

- Wear a lead or lead equivalent vinyl gown while in theatre when x-rays are being used.
- Stand behind one of the mobile lead screens if a lead gown cannot be worn.
- Never place any part of the body in the x-ray beam.
- Stand as far back from the patient as possible to minimise scattered radiation exposure.
- When the x-ray beam is pointing horizontally (i.e. taking a lateral image of the patient), stand on the Image Intensifier side of the patient, rather than on the side with the x-ray tube. The scattered radiation from the patient can be as much as a factor of ten higher on the beam-entrance side of the patient.

4.1.1 Personal protective equipment

Aprons should be of at least 0.3 mm lead equivalence (at 100 kVp). All personal protective clothing should be clearly labelled with its lead equivalence and a unique identification number as specified by AS/NZS 4543.3.2000 and examined under fluoroscopy at least annually to confirm its shielding integrity. 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. The patient is positioned in a lithotomy position. Patient positioning will be performed by a radiation therapist in the theatre and positioning will be confirmed by the radiation oncologist and urologist.

- After the patient is positioned, a urinary catheter is inserted and 30 to 50 mls of contrast material is injected into the bladder so that it may be identified on fluoroscopy. The catheter is then withdrawn to below the prostate apex and KY gel is injected into the catheter to allow visualisation of the urethra.
- A rectal ultrasound probe is positioned along the midline of the patient. Fluoroscopy is used to confirm the position of the ultrasound probe prior to visualisation with the ultrasound equipment. Appropriate positioning of the prostate and ultrasound probe will be undertaken with the aid of fluoroscopy. Once the position is set, the grid applicator is attached to the ultrasound transducer and the implantation may proceed.
- When the needles are removed from the Brachytherapy Trolley, the Physicist will inform all staff present that anyone near the needles or in the vicinity of the patient's pelvic region should have their shoe soles scanned before leaving the theatre. In general, 20 to 35 needles are usually inserted. The needles contain approximately 100 seeds, and are inserted using the trans-perineal approach. Needles will be loaded within the Radiation Oncology Department and will be transported up to theatres. If further needles are required during the case, they will be supplied by the Radiation Oncology staff. Needle position and seed placement is performed with the aid of ultrasound, fluoroscopy and direct measurements using an X, Y, and Z coordinate system.
- At the conclusion of the procedure, the implant is evaluated by the radiation oncologist and physicist who will determine whether additional seeds are required. These additional seeds are used to compensate for any areas of under-dosing within the prostate. Generally, some spare seeds will be prepared and sterilised before the procedure and will be available if compensation is deemed necessary. The Physicist will scan the used needles, any equipment used in the procedure, including linen, all the shoe soles of staff present in theatres, and the floor around the pelvic region of the patient for any dropped seeds.
- Once the seeds have been implanted the catheter will be reinserted into the bladder. The bladder drained and the catheter will be removed. The patient will then be transported to the Recovery Room and, when stable, will be transported to the Radiation Oncology Department patient bed bay for further monitoring. Once the patient has passed urine, instructions will be given to the patient and they may proceed home. A seed brachytherapy Physicist should be called by the nurse to scan the bed area, rubbish bin and any linen used by the patient, before cleaning the area.
- 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 he is discharged from hospital. Discharge may be from the Radiation Oncology Department or from the ward if the patient is subsequently admitted.
- At all times whenever the patient passes urine, the urine must be strained and assessed for any seeds. A lead pot and strainer will be made available for the patient / staff so that the seeds may be captured and stored safely. Any loose seeds must be handled using tweezers – they must never be directly handled. Any seeds that are captured or stored must be recorded, and a physicist or radiation oncologist must be notified.

- Prior to the patient going home, they are to be given a lead pot and strainer and made aware that they must continue to strain their urine for the first week after implantation and collect any seeds which may be passed, using a spoon to remove seeds from the strainer and place them in the lead pot.

5. DOCUMENTATION

- SOPs for diagnostic x-ray and fluoroscopic procedures

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 14.1 (2008) The Safety Guide for Radiation Protection in Diagnostic and Interventional Radiology

[2] ARPANSA RPS 14.2 (2008) The Safety Guide for Radiation Protection in Nuclear Medicine (RPS14.2)

[3] ARPANSA RPS 14.3 (2008) The Safety Guide for Radiation Protection in Radiotherapy

[4] EPA Policy on x-ray protective clothing

8. REVISION AND APPROVAL HISTORY

Date	Revision No.	Author and Approval
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
March 2020	2	Updates endorsed by Executive Sponsor