1. Contacts

Every person working with radioactive sources is required to protect themselves and all others from any hazard arising from their use as far as reasonably practicable and to follow all advice provided by the Radiation Protection Advisor (RPA).

The following staff can provide further advice tailored to the individual circumstances:

Role	Contact details
RPA and Head of Leicester Radiation Safety Service (LRSS)	Medical Physics, ext. 6750 or 5978. Out of hours – via switchboard (numbers are on the NAIR* list).
Medical Physics Experts (MPE)	Nuclear Medicine Reception ext. 5627/3850 Out of hours – via switchboard (numbers are on the NAIR* list).
Registered Nuclear Medicine Physicists	Nuclear Medicine Reception ext. 5627/3850 Out of hours – via switchboard (numbers are on the NAIR* list).
Nuclear Medicine Radiation Protection Supervisor (RPS)	Ext. 6067

* 'NAIR' is National Arrangements for Incidents involving Radioactivity – switchboard have access to contact details for UHL staff for this scheme. This list is also used for out of hours contact arrangements.

2. Introduction and Who Guideline applies to

Molecular Radiotherapy (mRT) patients (including patients given radioiodine (I-131), Lutitium-177 (Lu-177), Yttrium-90 (Y-90) and Phosperous-32 (P-32) at UHL or other hospitals) are relatively self-caring and hence there is only a minimal need for close personal contact between the patient

and medical/nursing staff during the period that the patient is radioactive. Any complications that require more intensive nursing are risk assessed by Nuclear Medicine Physics prior to admission for treatment. Any deviations from complications assessed at admission need to be escalated to Nuclear Medicine. Established procedures are in place for the care of these patients for inpatient treatment by trained staff on ward 39, Windsor Building, LRI. These include local rules containing contingency plans for emergency situations (which must be read staff working in the molecular radiotherapy room, in conjunction with this document). This document is aimed solely at circumstances outside of the norm where;

- There is a need to transfer a patient out of the purpose-built facility on ward 39 to receive more specialist treatment. The staff providing this care may not have had any training in relation to caring for radioactive patients
- The patient's medical condition has deteriorated such that more intensive medical/nursing care may be required, necessitating extended periods of close personal contact between the patient and staff
- The patient returns to hospital following discharge (including patients treated outside of UHL)
- The patient dies (including patients treated outside of UHL)

The radioisotopes used for mRT emit beta and gamma radiation. This will be present in the patient bodily fluids, including sweat, blood, urine and faeces, as well as build up in some organs. The quantity will vary depending on how long it has been since their last treatment. The main hazards from this type of radiation to staff are the external dose rate from the gamma radiation, and contamination from bodily fluids, leading to skin contamination and inhalation or ingestion of radioactive material. The measures provided in the document and patient specific advice from Nuclear Medicine and LRSS should ensure that no staff member caring for a patient receives more than 1 mSv of radiation dose.

Any radiation dose, from any source, carries a small risk - the current best estimate is that the increase in the risk of developing a cancer is no more than 0.005% (1 in 20,000) for every mSv of radiation dose received. The natural risk of developing cancer is around 33.33% (1 in 3), so the total risk for a person receiving an additional radiation dose of 1 unit is 33.335% (1.00008 in 3). The additional risk is very small in the context of other everyday risks (such as travelling by car or train).

All patients who have received mRT will be given an instruction card on discharge which will detail when they had their last radioactive administration. They are informed to keep this with them at all times and to present it if they attend for a medical appointment.

The overarching principle should be that the immediate medical needs of the patient concerned must be given priority over the radiation hazard. The medical staff involved with the patient's care must be involved in any discussion to ensure the clinical needs of the patient are met.

This document gives an overview of the radiation protection issues and some initial guidance on how to manage these risks.

3. Guideline Standards and Procedures

1. Transfer of an mRT patient out of the purpose built isolation room in ward 39

Transfer of a mRT therapy patient out of the purpose-built facilities on ward 39 should only be made where a medical emergency pertaining to this patient makes such action essential. The RPS for ward 39, the RPA and a registered Nuclear Medicine Physicist must be notified of such action and further advice sought. If the emergency is out of hours, the emergency physicist can be contacted via switchboard.

Ideally, the patient should be relocated to a side room with en-suite toilet and washing facilities. Should it be essential to locate the patient in an "open area", such as occurs on a high dependency unit, the patient should be located at the far end of the facility in relation to the entrance/exit, so that people only approach the area when specifically attending this patient. The area should be demarcated where possible, with tape on the floor or moveable screens, providing they do not present a hazard in accessing the patient. A "controlled area" notice should be posted so that there can be no misunderstanding of the extent of the controlled area that staff should only enter under the written system of work. Only essential staff members should be allowed access to the patient, to reduce radiation doses. Protective shoes and gloves must be worn when entering the area, and removed and monitored for radiation when entering the "clean" area.

Any equipment that has been in contract with the patient, or waste items, such as syringes, must be monitored for radiation before leaving the area. Specimens or samples for pathology may be radioactive. Nuclear Medicine may have to check samples for radiation before they are sent to pathology. If the results are urgent, label the samples as 'Radioactive – Please contact Nuclear Medicine - Not for disposal' before sending to Pathology.

If the move is planned, a handover is required by nuclear medicine physics, including;

- Training
- Details of the hazards
- Relevant systems of work for: transporting patients, managing laundry and radioactive waste, visitors, discharge and fire,
- Relevant equipment (Warning signs, Dosimeters and radioactive waste bins)

Patient excreta and waste body fluids, e.g. from dialysis, patient washing, vomit etc. should ideally be disposed of down the toilet in the patient's room (dedicated solely for their use) and any disposable receptacles placed in the radioactive waste bag. The toilet should be flushed twice after all such disposals. Where dedicated toilet facilities are not available, the waste fluids should be disposed of using the ward sluice, taking care to ensure fluids are not spilt. This is in compliance with the requirements of the disposal of radioactive waste in the Environmental Permitting Regulations 2016.

Procedures for dealing with contaminated linen and radioactive waste will be provided by Nuclear Medicine Physics. If in doubt, leave the linen in the patient's room and seek advice from the a registered Nuclear Medicine Physicist or the Trust RPA. The person in charge of the ward must ensure that domestic staff are appropriately advised of all the restrictions relating to the mRT patients in relation to the tasks that they routinely undertake.

2. Delivering intensive nursing care to mRT patients

At the outset it must be stressed that such an occurrence is extremely rare. Nuclear Medicine Physics or LRSS should be contracted as soon as possible, to provide advice and contact restrictions if required, or if the emergency is out of hours, the emergency physicist can be contacted via switchboard. If the patient condition deteriorates while they are an inpatient on ward 39 and require more intensive nursing, staff who have undertaken radiation protection training from Nuclear Medicine Physics and who have been issued with personal dosimeters should attend the patient, where possible. Other staff members who will be required to enter the room regularly, must read the local rules for the area, follow all instructions (e.g. PPE) and wear dosimeters. Extra precautions may be required for any surgical procedures.

A notepad should be placed at the entrance to the controlled area. All persons entering the area should note their name and time of entry. On departure they should record the approximate number of minutes/hours that they spent at distances of 0.1m, 0.5m or 1m away from the patient.

Pregnant staff should not deliver nursing care to a high dependency mRT patient.

Avoidance of Internal Radiation Contamination

All of the patients bodily excretions, to include saliva and perspiration, may be contaminated with radiation. **The mRT patient should effectively be "barrier nursed" to avoid spread of contamination** and the procedures outlined for “source isolation (barrier nursing) in the “isolation precautions UHL Policy” B62/2011 should be followed, in addition to the radiation protection advice here.

A radioactive waste bin should be set up at the entrance to the controlled area. Staff should wear two pairs of gloves, overshoes and a plastic apron when personal contact with the patient is required. These must be deposited in the radioactive waste bin on leaving the controlled area. Staff must then immediately wash their hands thoroughly and deposit the paper towel from hand drying in the radioactive waste bin. A contamination monitor is available at the entrance for staff to check their hands and feet for any radiation contamination.

Only essential blood and urine samples should be collected and sent to the laboratory and these must be appropriately labelled as "radioactive", stating the radionuclide.

3. The patient returns to hospital following discharge

This section refers to patients who have been undergone mRT (either at UHL or another hospital), discharged and subsequently come to the Emergency Department.

Patients will only be discharged from hospital once the levels of radiation have fallen below a certain level. They will be issued with restrictions (usually in the form of a restrictions card). If they are outside the time for these restrictions, the patient should be treated as normal (i.e. non-radioactive).

There is no need to withhold or delay clinical care for these patients, particularly if there is an urgent clinical need. Contact nuclear medicine physics for further advice, or the emergency physicist out of hours (via switchboard).

The risk of contamination during routine contact is minimal and normal precautions (gloves and aprons) will be sufficient to protect staff caring for these patients.

There is a risk of radiation exposure due to prolonged close contact and the patients will have been provided with a set of written instructions to minimize any risk to others.

- The patient should sit in an area approximately 1 metre away from other staff, patients and visitors and should avoid contact with pregnant women and children.
- Each member of staff in the emergency department should limit close contact (< 1 m) to a period of 2 hours
- Pregnant staff should not be involved with the care of the patient
- If the radioiodine was administered within the previous week, only clinically urgent specimens/samples should be taken. Specimens/samples must be labelled "RADIOACTIVE" and should not be transferred outside UHL or disposed of without consulting Nuclear Medicine.

4. Death of an mRT Patient see Last Offices and Care of the Deceased Patient Policy B28/2010

Considerable tact and sensitivity will be required in the dealings with the patient's relatives who may be present at or soon after the death. Where imminent death is anticipated, relatives may wish to remain with the patient. Relatives should keep a distance of 1m away as much as possible to restrict their radiation exposure. Specific advice should be sought from the RPA or Nuclear Medicine Physics on an individual patient basis.

Last rites may be performed as normal but two pairs of gloves, aprons and overshoes must be worn.

In the event of the death of a mRT inpatient, it is likely that special precautions may need to be taken. The procedure outlined below should be followed. The RPA and Nuclear Medicine Physics should be notified as soon as possible. They will then issue any additional advice that is required resolve any queries.

Nursing staff should wear protective gloves (two pairs) and an apron. The body should be placed in a bag as soon as possible, to prevent leakage and spread of contamination. For patient death during inpatient molecular radiotherapy, staff should be made aware that normal procedures of releasing waste by pressing on the abdomen of the deceased patient must not be followed, and orifices should not be blocked.

Any patient excreta may be contaminated with radiation and should be placed in a leak proof double plastic bag, sealed and left in the patient's room for monitoring by Nuclear Medicine staff.

It is essential that the relatives have the opportunity to see the deceased whilst the corpse is still located in bed on the ward. Relatives should wear two pairs of gloves, overshoes and an apron. To minimise radiation exposure of the relatives, this visit to the patient should be kept reasonable short, bearing in mind the sensitivity of the situation, e.g. a maximum of ½ hour if within 48 hours of the dose administration, and up to 1 hour thereafter and physical contact kept to a minimum.

The body should be labelled as being radioactive and remain in the room where they were nursed until further advice is provided by the RPA or Nuclear Medicine Physics. The area must remain controlled and the systems of work (for a live patient) followed.

Disposal of all radioactive waste from the room must be undertaken by Nuclear Medicine staff.

Advice must be obtained from the RPA or Nuclear Medicine Physics before the corpse is removed from the room.

The RPA or Nuclear Medicine Physics will provide advice on further action including advice to the mortuary and funeral directors as appropriate and ensure all necessary radiation protection measures are in place.

If a post mortem is to be carried out, advice must be sought from the RPA or Nuclear Medicine Physics who will advise the pathologist of the expected radioactivity remaining in the corpse and confirm the precautions to be taken.

Two sets of gloves must be worn. If the gloves are cut or torn during the examination and the skin is broken or a wound sustained, the injury should be irrigated immediately with tap water. Monitoring and decontamination procedures should then be followed.

After the examination, the post mortem room, instruments, equipment and protective clothing should be checked by Medical Physics staff for contamination and decontaminated if necessary.

Precautions may be necessary for embalming, burial or cremation. The RPA or Nuclear Medicine Physics will provide details, depending on the amount of radiation still present in the patient at the time of death.

4. Education and Training

Awareness of the guideline will be made to mortuary staff, Emergency Department staff and Oncology staff (those most likely to need to refer to it) by Nuclear Medicine. Training and advice will be provided and recorded on a per patient basis (tailored to the needs of the patient) by LRSS or Nuclear Medicine, in line with the requirements of the Health and Safety at Work Act to protect staff. Elearning packages for the Ionising Radiation Regulations 2017 and the Ionising Radiation (Medical Exposure) Regulations 2017 are available for all staff on HELM.

5. Monitoring Compliance

What will be measured to monitor compliance	How will compliance be monitored	Monitoring Lead	Frequency	Reporting arrangements
Datix incidents involving mRT patients	These would be reviewed at the Radiation Protection Committee (RPC) meetings	RPC	Quarterly	Minutes from meeting

6. Supporting References

Radiation Safety Policy (Trust Ref B26/2019)

Ionising Radiation (Medical Exposure) Regulations 2017 Policy (Trust Ref B26/2019)

Personal Protective Equipment at Work Policy (Trust Ref B9/2004)

7. Key Words

Molecular Radiotherapy, radiation, nuclear medicine

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Details of Changes made during review: supporting references updated	