

Procedure for Safe Handling of Cadavers with Radionuclides

Radioactive sources are used as sealed sources, temporarily or permanently embedded in the soft tissue or cavities of the body as a part of brachytherapy procedures, or they may be administered to the patient as radiopharmaceuticals by oral, intravenous routes or by loco-regional instillation for nuclear medicine applications. If a patient dies immediately following a nuclear medicine therapy or brachytherapy sources implanted, special precautions for limiting radiation exposure may be recommended for processes such as autopsy, embalment and cremation.

Nuclear Medicine

At the time of discharge of a patient following radionuclide therapy, written instruction should be given in patient's medical record to notify, the Nuclear Medicine Physician of the treatment facility, in the event of death of the patient. The RSO and the Nuclear Medicine Physician should decide the safety precautions to be followed, if any, regarding disposal of cadavers containing radionuclides.

The following safety precautions shall be observed in respect of dead bodies containing activities more than the discharge limit:

1. All reasonable efforts should be made to remove fluids or organs in which radionuclide is concentrated, provided the collective dose equivalent received in the procedure will be less than that in handling the cadaver as it is.
2. Undertaking should be taken by RSO and Nuclear Medicine Physician of the hospital from the relative of the deceased with respect to adherence to the instructions given by RSO to be followed during transport and further handling of the dead body till burial/cremation.
3. The body should be transported by road in an exclusive vehicle.
4. The relative traveling with the body should be seated next to the driver or at least one meter away from the body.
5. Relatives shall be prevented from coming into contact with the body and people must not stay near the coffin. Children and pregnant women should be kept away from the body. The hospital staff and the persons involved in washing, preparing and transporting the body to the burial ground shall be instructed by RSO on dose reducing precautions. The body shall be handled with disposable gloves and kept on plastic sheets to control spread of contamination.
6. Embalming is undesirable and, if unavoidable, shall be done by injection method. All contamination control measures shall be observed under the guidance of RSO. Personnel involved in the procedure should follow precautions similar to those used for infection control (i.e., use of gloves and protective clothing) to avoid personal contamination.
7. Autopsy on contaminated cadavers shall be performed only in a special autopsy room provided with facilities such as a plastic covered table, water-proof flooring, and receptacles for organs, instrument cabinet and a washing stand for the pathologist. A refrigerator for keeping the cadavers at temperatures below -10°C shall be provided. The RSO shall supervise autopsy procedures and subsequent decontamination operations.

Radiotherapy

If a patient dies within the hospital after a brachytherapy implant, the dead body shall not be handed over to the claimants until all the sources have been removed and accounted for and the body duly monitored by the RSO to confirm removal of all sources. Post-mortem examination, if any, should not be performed unless all sealed sources have been removed from the body and accounted for.

When the patient is discharged from hospital with sources in-situ, i.e. in case of permanent implant, instruction should be given in patient's medical notes to notify the doctor of the treatment facility if the patient dies within 2 years from date of implant in case of I-125 implants and within 3 months from date of implant in case of Pd-103 implants. On receiving such intimation, the doctor in consultation with RSO of the facility, should guide the patient's relatives regarding measures to be taken to keep radiation doses and contamination risks as low as reasonably achievable. The following will form the basis for providing such guidance:

1. No special precautions are normally necessary for autopsy, embalming or cremation of a corpse if death occurs after the time frame specified in the table below;

Table: Time frame within which additional precautions are required

Radionuclide	Time Frame		
	Autopsy	Embalmmnt	Cremation
¹²⁵ I	2years	1 month	2 years
¹⁰³ Pd	3months	1 month	3 months

2. Burial or entombment of bodies with residual activity can be performed at any time. Permanently implanted sources are not normally an impediment to burial or entombment since, once the body is buried or entombed, the sources are well shielded. Hence, burial or entombment should be preferred wherever possible.
3. If the family of deceased is opting for cremation, it should be advised to spend minimum time near the cremated remains as radiation sources may survive the cremation process and could therefore be present in the cremated remains. Cremated remains should not be scattered until 10 half-lives from the date of implant and should be stored in a metal container.
4. There will be a small amount of dose received while conducting an autopsy or embalmmnt, due to external radiation from the radionuclides within the body. The radiation sources will remain sealed within the seed and will be contained in a single organ or site. There is minimal risk of the presence of contamination as long as the seeds are not ruptured. Hence, it should be ensured that tissue around the implant should remain intact during autopsy.

References

1. ARPANSA Safety Guide for Radiation Protection in Nuclear Medicine (2008)
2. ARPANSA Safety Guide for Radiation Protection in Radiotherapy (2008)
3. NCRP report no. 155, Management of Radionuclide therapy patients
4. IAEA Safety Report Series no.63, Release of patients after radionuclide therapy (2009)
5. IAEA Specific Safety Guide no. 46, Radiation Protection and Safety in Medical Uses of Ionizing Radiation (2018)
6. Radiation Protection Guidelines for Safe Handling of Decedents, CNSC REGDOC 2-7-3
7. AERB safety Code for Radio Therapy Practice
8. Journal of applied clinical med physics, - *Radiation Safety issues regarding the cremation of the body of an I-125 prostate implant patient.*