



Statement on Safe Handling of Deceased Persons Recently Treated with Radioactive Material

June 2010

Who should read this Statement?

This Statement is intended to provide information to persons such as cemetery and crematorium workers, funeral parlour staff and directors, embalmers and coroners, who in the course of their work may be required to deal with deceased persons who had recently undergone procedures involving radioactive material.

How is radioactive material used in medicine for diagnosis and therapy?

Radioactive material has been used for the diagnosis and treatment of various medical conditions ever since the discovery of radioactivity. This material comes in several different forms and may have different radiation properties.

Radioactive material used in medical diagnosis is generally in liquid or gaseous form and is administered by injection, orally, or by inhalation. This radioactive material is generally very short-lived and this combined with the low activities used for diagnostic purposes and the rapid excretion from the body (in the living patient) means that very little residual radioactive material remains in the patient after a day or two.

Radioactive materials used for medical treatment generally involve greater quantities of radioactivity (than is used for diagnostic purposes). It may be non-penetrating (so that little if any radiation emerges from the body of the patient who effectively acts as a shield) or it may also have a penetrating component (meaning that other people in the close vicinity of the patient will receive some exposure to radiation coming from the radioactive material within the patient). Radioactive material used for treatment comes in different forms:

- (a) 'unsealed sources' (liquid or suspension form) which are administered by injection, infusion or orally
- (b) 'sealed sources' where the material is encapsulated in forms such as 'seeds' or wire. These may be temporarily or permanently attached to, or implanted in, the patient.

Many treatments using radioactive material are given to patients where the prospects of cure or control of their disease is good. However in some cases treatments are given to very ill patients (although not generally where imminent death can be foreseen), and there is always the possibility that a patient may die of an unrelated cause.

What happens if a patient dies while still in a medical facility?

In the rare event that a patient dies within a medical facility after undergoing treatment with radioactive material, the Radiation Safety Officer or delegated physicist should be consulted before any procedures such as laying out or post-mortem are commenced and before the body is released for embalming, burial or cremation.

The Medical Code of Practice¹ requires that medical facilities have systems in place to ensure that as a consequence of a patient dying with radioactive material above relevant exemption levels still in their body:

- (a) exposure to radiation of any person handling the body is minimised
- (b) each temporarily implanted sealed source or radioactive applicator is removed
- (c) consideration is given as to whether a permanent implant or tissue containing unsealed radioactive material is to be excised
- (d) the level of activity of a permanent implant or unsealed radioactive material remaining in the body is calculated and documented
- (e) where a permanent implant or unsealed radioactive material remains in the body, written instructions regarding handling and safety are provided to each person who handles the body.

Further information can be found in:

ARPANSA Radiation Protection Series No.14.2: Safety Guide for Radiation Protection in Nuclear Medicine (2008), http://www.arpansa.gov.au/Publications/codes/rps14_2.cfm

ARPANSA Radiation Protection Series No.14.3: Safety Guide for Radiation Protection in Radiotherapy (2008), http://www.arpansa.gov.au/Publications/codes/rps14_3.cfm

What happens if a patient dies outside a medical facility?

If a patient is released from a hospital or clinic after treatment with radioactive material, the medical facility should have considered the individual's circumstances and should have provided written instructions about any precautions, in line with ARPANSA's Radiation Protection Series No.4.² This information should include:

- the radioactive material administered, the activity administered and date of administration
- name(s) and contact number(s) of the prescribing doctor and/or radiation safety officer or medical physicist, for emergencies or other hospitalisation
- the duration of any pertinent radiation safety restrictions.

If the patient subsequently dies, this information will be relevant to those who are required to handle the body. Further information or clarification can be sought from the medical specialist or Radiation Safety Officer/physicist from the medical facility.

Post-mortem or embalming

For radioactive material remaining in the corpse, it is important to note the difference between external radiation exposure and radioactive contamination. External exposure to penetrating radiation emanating from a radioactive source occurs at a distance from the source (usually short in this context). External radiation may be partially shielded by the corpse itself. Radioactive contamination is associated with actual contact with the radioactive material and spread of the material, and it is analogous to chemical contamination.

¹ ARPANSA Code of Practice: Radiation Protection in the Medical Applications of Ionizing Radiation: RPS 14, <http://www.arpansa.gov.au/Publications/codes/rps14.cfm>

² ARPANSA: Radiation Protection Series No. 4 Recommendations for the Discharge of Patients Undergoing Treatment with Radioactive Substances (2002) <http://www.arpansa.gov.au/Publications/codes/rps4.cfm>

- Reduction of external exposure from either sealed sources or aggregation of unsealed radioactive material in the corpse:

As far as practical, the working distance from the sealed source implant site or any organs containing the bulk of unsealed radioactive material should be maximised while dealing with the corpse. If an organ containing radioactive material needs to be handled, suitable tools such as tongs or forceps should be used to maximise the distance of the hands from the radioactive material, and the time spent carrying out the procedure kept as short as possible.

- Prevention of contamination:

Sealed sources do not release radioactive material into the body fluids. For unsealed radioactive material, standard precautions similar to those used for infection control should be used, including gloves, face shield, and gown. Most unsealed radioactive material is either taken up by the target organ and/or eliminated by excretion in the first few days of treatment. The most significant post-death risk of contamination from radioactive material, such as iodine-131, is when death has occurred within these first few days and substantial amounts of radioactive material may remain in the body fluids, tissues or organs. Further advice concerning precautionary actions can be obtained from the medical specialist or the Radiation Safety Officer/physicist where the patient was treated.

Handling of the coffin

No restrictions are normally needed in dealing with the closed coffin following the death of a patient that has been recently released from a hospital after treatment with radioactive material.

Cremation

The fate of the radioactive material during cremation depends on the physical and chemical form and whether it has been incorporated into the bone, and these in turn will determine any radiation safety precautions.

Where the radioactive treatment involves

- unsealed radioactive material that has been incorporated into bone, or
- permanently implanted sealed sources encapsulated in metal that survives the combustion process,

some radioactivity will remain in or amongst the skeletal remains.

Two treatments are noteworthy as examples of the above:

- (a) *Strontium-89 (injection) which may be used to lessen bone pain associated with various cancers, particularly advanced prostate cancer, that has spread to the bone.* The strontium-89 will persist in the bone for some months and also in the remains. These patients are in an advanced stage of their disease and death is not uncommon within the first few months after treatment.

Strontium-89 has no penetrating radiation component and so is completely shielded in the body until after the cremation process. Precautions should be taken by the crematorium staff when handling the remains to prevent ingestion of radioactive material, contamination of the working area, or cross contamination of the remains of other deceased persons. This should include use of standard protective equipment (such as gloves, face masks and shields, gowns and overshoes) when handling the remains and use of various handling tools where appropriate.

Some restrictions may need to be placed on an urn which contains radioactive remains before it can be released from the cemetery to the family or family's representative. No restrictions are necessary for immediate burial of the remains at the cemetery. The medical facility or the relevant radiation regulatory authority³ should be able to give advice in this area.

- (b) *Iodine-125 'seeds' used as a permanent implant in the treatment of some cancers such as early prostate cancer.* (A typical implant consists of ~ 100 tiny metal-encapsulated seeds each a few mm in length.) It is recommended that cremation is not carried out within one year following insertion of iodine-125 seed prostate implants unless the implant is first excised from the body. (After this time interval, the activity of the individual seeds is well below exemption levels). It is worth noting that patients receiving this treatment option are unlikely to die from the disease within the first year.

Where the radioactive treatment involves unsealed radioactive materials which have *not* been incorporated into the bone of the deceased and which are expelled into the cremation furnace and flue during combustion, the remains will not be radioactive and so do not require handling and storage precautions.

Direct burial or mausoleum entombment

No restrictions are normally needed for direct burial or mausoleum entombment following death of a patient recently treated with radioactive material.

Further information

Management of Radionuclide Therapy Patients: NCRP No.155 (2006)

<http://www.ncrppublications.org/Reports/155>

Information for People Handling Deceased Persons Containing Radiopharmaceuticals: Victorian Department of Health, Radiation Safety

http://www.health.vic.gov.au/environment/downloads/radiation/guidelines_corpse_disp.pdf

Department of Health, Government of Western Australia: *Cremation regulations in Western Australia: Risk assessment requirements for radioactive therapeutic implants and/or radiopharmaceuticals*

<http://www.health.wa.gov.au/cremations/home/implants.cfm>

Radiological Council of Western Australia: *Radiation Safety Guidelines in the Event of Death of a Patient Following Administration of Radionuclides* (April 2010)

Radiological Council of Western Australia: *Requirements for Cremation of Deceased Patients following Treatment with Radioactive Substances* (August 2008, updated June 2009)

Environment Protection Authority, Radiation Protection Division, Government of SA: *Cremation of Deceased Persons Containing Strontium-89 and Disposal of Remains*

³ <http://www.arpana.gov.au/Regulation/regulators/index.cfm>