Australian Government

Australian Radiation Protection and Nuclear Safety Agency

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Nuclear Medicine Incidents from the Australian Radiation Incident Register (ARIR)

ARIR is the national register to which the Australian radiation regulators contribute reports. This brochure is an extract of the latest annual report, covering incidents which relate to nuclear medicine from 2016. The full report and further information is available on the *ARPANSA website*.

Labelling

Labelling is an important control measure in nuclear medicine and was a contributing factor in a number of nuclear medicine incidents. Labelling can be complicated by the fact that shielding used to protect the operator can often hide labels which would otherwise identify the product, and labelling on the outside of the shielding can be mismatched to the contents.

Example case

In one instance two different renal scans were scheduled for the same time. The doses were dispensed by the lab and placed in shielded syringes on trays with the printed dose slip and an absorbent tray liner. The tray liners had the scheduled time of injection, the patient name and the procedure written on them. The needle cap also had a printed sticker with the isotope and activity. In this instance the tray was (incorrectly) labelled with the patient's name and radiopharmaceutical DSMA (dimercaptosuccinic acid). The dose slip was labelled 'renal' which matched the type of procedure to be performed. However, during the procedure the technologist read the label on the needle, which correctly identified the pharmaceutical as MAG3 (mercaptoacetyltriglycine), and halted the injection. This partial injection resulted in an additional dose of 1.4 mSv. On closer examination the dose slip was also labelled with a different patient's name. This highlights the importance of clear labelling and quality control.

Learning

The label 'renal' could describe a number of radiopharmaceuticals and a more specific label such as DSMA should be used.

Quality control

Quality control (QC) checks are an important part of patient safety. There are typically a number of steps in place to ensure that a single error does not result in additional dose to patients.

A large number of QC tasks are performed frequently with a very low rate of error. This includes checking for reconstitution and binding errors or chemical impurities. When a task is repeated frequently without an issue, complacency can easily set in. This is a common difficulty in dealing with low likelihood risks. When we expect a favourable outcome we can lose awareness of the true risk associated with a task or the importance of the controls that are rarely challenged.

Example case

The reconstitution of ^{99m}Tc-MAG3 was not picked up during QC. A mix-up occurred between two elutes where counting tubes were sealed using the incorrect lids labelled '1' and '2'. The sample of 1% purity was then incorrectly interpreted as 99% purity (1% impurity).

This incident resulted in an additional dose of approximately 1.6 mSv to the patient. Improvements in labelling and workflow were implemented.

Learning

The report noted that a contributing factor may be that failure of MAG3 reconstitution is quite rare. Technicians performing the procedure are therefore generally expecting a pass result and may be less alert to the possibility of failure.

Leaks and spills

A number of incidents involved leakages during administration. These incidents highlight the need to ensure that connections are secure and flushed with saline as appropriate. Spills or leakages can also occur from the syringe prior to injection such as during transport.

Example cases

(1) During a stress test using ^{99m}Tc-MIBI, the syringe attached to a three-way tap leaked approximately half of the radiopharmaceutical (400 MBq) onto the treadmill and floor.

The report noted that the three-way tap was found to be incompletely tightened to the extension tubing.

(2) A patient was being administered with ^{18}F-FDG via a cannula when the extension tubing and the three way tap became disconnected. A volume of product containing an activity of 90 MBq was spilled on the bed, floor, and the technologist's shoes.

The report identified that training of the nurse who cannulated the patient was a factor in this incident.

Learnings

One institution implemented an additional check by the technologist to physically inspect all components prepared by the nurse immediately prior to administration.

Example case

^{131}I-Lipiodol leaked from a syringe prior to use. The syringe had a capped needle which is thought to have leaked when the lid of the shield pushed on the plunger. In this instance 280 MBq leaked, of which 50–60 MBq spilt onto the floor. The room was not in use and clean-up was performed resulting in minimal exposure.

Learnings

As a result of the incident this type of syringe will no longer be transported with a needle cap; instead a plug infusion combination screw cap will be used.

Leaks and spills
(cont.)

Spills can also occur during the preparation and QC phase. This is particularly important for higher activity nuclear medicine which can require substantial shielding. This shielding can restrict movement and lead to ergonomically unfavorable setups. It is important to consider the human factors in the setup of these workstations.

Example case

A product vial containing ^{18}F-FDG was dropped during dispensing. When discharging a product vial containing ^{18}F-FDG from the dispensing hot cell into a tungsten transport pot the dose rate indicator on the operator's Electronic Personal Dosimeter (EPD) suggested that the vial had not fully dropped into the tungsten pot and was only partially shielded. After attempting to rectify the problem, the operator assumed the vial was within the tungsten pot and opened the drawer. The vial dislodged from the top of the pot and fell onto the floor under the dispensing hot cell. This resulted in a small crack in the bottom rim on the vial. Most of the product was retained in the vial however a small amount of contamination was found on the floor underneath the dispensing hot cell.

Learnings

As a result of this incident bubble wrap drapes lined with absorbent material have been fitted so that in the event of a vial being dropped the risk of damage to the vial is low. To improve visibility, the battery operated light was replaced with an LED light which is automatically turned on when using the dispensing hot cell.

More about ARIR

The ARIR is the repository of radiation incident information from Commonwealth, state and territory radiation regulators. It is intended to raise awareness of radiation safety and to facilitate the sharing of lessons learnt from radiation incidents across Australia.

What you can do to help

The ARIR relies on information submitted by individuals and organisations to their regulator. You can help us by ensuring your report identifies the underlying causes which contributed to the incident and clearly outlining lessons learnt or potential strategies which others may be interested in. More information on underlying causes and holistic safety can be found on the ARPANSA website.

Contact ARPANSA

For more information visit *arpansa.gov.au* or email *info@arpansa.gov.au*.