Australian Government

Australian Radiation Protection and Nuclear Safety Agency

AUSTRALIAN RADIATION INCIDENT REGISTER (ARIR)

SUMMARY OF RADIATION INCIDENTS: 1 JANUARY TO 31 DECEMBER 2006

The total number of radiation incidents reported to the Register that occurred during the period from 1 January to 31 December 2006 was **90**. A summary of the incidents in each category is given below:

Diagnostic Radiology: 27 Incidents

14 incidents involved patients being given unnecessary/unplanned CT scans/radiology examinations due to mistaken identity. In seven of these cases, the wrong patient identification label or name had been placed on the X-ray request form. In three cases, the mistaken identity was due to the incorrect identification of a patient by radiology staff due to procedural errors, in two cases the mistaken identity involved patients with the same surname and in one case the patient answered to the wrong name. In the last case, two patients received swapped examinations – one a CT chest and the other a chest X-ray. The dose to first patient from the additional X-ray was estimated to be 0.1 mSv, while the other patient received a dose of 13 mSv from the high-resolution CT chest scan.

Eleven of these incidents involved CT scans, where the unnecessary patient doses ranged from approximately 1 mSv to 19 mSv, one involved a general radiology procedure only where the patient received an estimated effective dose estimated of 87µSv and one involved a fluoroscopy examination where the patient received a dose of 1.5 mSv. The last case involved both Ct and radiology.

4 incidents involving a CT scan performed on the wrong region of a patient. All cases were due to the radiographer not verifying the procedure prior to the examination. The patients received doses ranging from approximately 2 mSv to 7 mSv.

4 incidents involving an unnecessary repeat CT scan given to the patient. One case involved the inadvertent CT scan of a patient due to the patient answering to the wrong name. Upon realising the error, the radiographer deleted the scan from the hospital's PACS archiving system. The following day it was realised that the patient actually required the scan so it was repeated, resulting in an additional dose of 10 mSv. Another case, involved a patient's CT scans not being archived or reported. They were subsequently deleted from the CT scanners hard drive and had to be repeated - the patient received an estimated effective dose of 22 mSv. The third case involved a patient receiving a dose of 35 mSv due to radiology staff not checking patient records to ascertain whether the examination had been previously performed. The fourth case involved a patient receiving a dose of 37 mSv from repeat CT scans due to confusion over the original scans, which had subsequently gone missing. The hospital's policy on correct handover of films was not adhered to.

2 incidents involved additional unnecessary/unplanned CT scans given. Both cases involved the radiographer incorrectly assuming that CT scans of other regions of the body were required to be performed in addition to the requested scans. The patients received doses of 4 mSv and 14 mSv respectively.

1 incident involved a patient receiving a higher than normal radiation dose (30 mSv) during a complicated catheterisation and embolisation procedure. A device inserted via catheter to stop blood flow from a coronary artery fistula became dislodged and passed into a patient's left

pulmonary artery. Attempts were made to recover the device which resulted in a longer than normal screening time and the patient receiving a dose of 30 mSv.

1 incident involved a patient receiving a higher than normal radiation dose during fluoroscopy. A patient had a diagnostic coronary angiogram closely followed by an interventional procedure with long screening time and several image runs using a fluoroscopy cardiovascular imaging system. This resulted in the patient receiving a skin dose of 13 Gy. The patient had an erythema reaction following the examination.

1 incident involving unnecessary/unplanned general diagnostic X-rays given due to clerical staff booking the wrong examination. Hospital clerical staff entered the wrong examination into the radiology information system. The radiographer failed to read the request form and performed the wrong examination. The patient received an estimated effective dose of 79 μSv.

Nuclear Medicine: 22 Incidents

8 incidents involved the wrong scanning agent/radiopharmaceutical being given to the patient. In 6 of these cases, a dispensing error occurred due to wrongly identifying the radiopharmaceutical by either misreading the labels, or selecting the wrong syringe, vial or lead pot. The additional estimated effective doses given to the patients ranged from approximately 2 mSv to 20 mSv. In one of the cases, a student chose the wrong 'stock' radiopharmaceutical, which resulted in two patients being injected with the wrong scanning agent, each receiving an additional dose of 9.6 mSv. In the other case a gallium-67 source, which was used for a QC check of a gamma camera, was left in the scanning suite and mistaken for technetium-99m. The patient received an additional effective dose of 10.3 mSv. In most of the cases it appeared that checking procedures prior to administration of the radiopharmaceutical were inadequate.

5 incidents involved the wrong patient being given the radiopharmaceutical. In 3 of these cases, an unnecessary/unplanned scan was given to the wrong patient due to medical staff incorrectly matching up the patient identification label with the request form. In one case the wrong patient was given the radiopharmaceutical due to mistaken identity and in the other case a patient had the same name as the intended patient. The resulting estimated additional effective doses to the patients ranged from 600 μSv to 5 mSv.

3 incidents involved using scanning agent/radiopharmaceuticals that had failed QC. Two separate cases involved technetium-99m which had failed QC checks being administered to a patient. In the first case, a nuclear medicine technologist misinterpreted the results of the QC procedure. The technetium-99m administered to the patient was subsequently unsuitable for the type of scan required, resulting in an additional effective dose to the patient of 6.4 mSv. In the second case, a vial of technetium-99m in a lead pot had failed QC checks and was left in the 'hot lab' for further testing. The lead pot did not have any markings on it and the technetium-99m was subsequently administered to a patient, resulting in an additional effective dose to the patient of 7.2 mSv. The other incident involved the delay of a scan whilst the patient took a pregnancy test. The original drawn up dose of technetium-99m was topped up to allow for decay during the delay, however it was miscalculated and was later found to fail a QC check. The patient received an additional effective dose of 7.4 mSv.

3 incidents involved scanning agent/radiopharmaceutical being spilt. Two of these cases, involved the spilling of glass vials in a 'hot lab'. The first case involved a nuclear medicine technologist spilling a vial containing approximately 5 GBq of technetium-99m on the floor. The spill covered area of about 1 m^2 and was cleaned up within 2 minutes. The dose received by the technologist was deemed to be insignificant. The second incident involved a vial containing 2 GBq of technetium-99m being smashed on the lead glass shield of the dose calibrator. Surfaces were cleaned up within 5 minutes. The estimated dose to the radiopharmacist was less than 10 μSv from the clean-up of the

spill. The other incident involved technetium-99m being splashed onto a nurse during injection of a patient undergoing an epileptic seizure. The estimated effective dose to the nurse was 0.8 mSv.

1 incident involved the wrong dose being delivered due to wrong protocol being undertaken. The wrong dose was delivered to a patient when the activity of technetium-99m for a 'rest' protocol was inadvertently drawn up from the vial instead of a higher activity for the prescribed 'stress' protocol. The patient received an additional dose of 1.8 mSv. The error was due to the vial containing the dose being labelled 'stress' and the activity not being verified prior to administration.

1 incident involved a patient being given bone mineral densitometry instead of a bone scan. A patient, who was prescribed to receive a nuclear medicine bone scan, was instead given bone mineral densitometry analysis. The effective dose to the patient was 170 μSv.

1 incident involved the administration of an incorrectly manufactured radiopharmaceutical. During a lung ventilation/perfusion scan it was found the injected technetium-99m did not uptake properly to the lungs. Analysis found that only 4% of the contents were the required technetium-99m-MAA and 96% was technetium-99m-pertechnetate. This resulted in an estimated effective dose to the patient of 1.76 mSv.

Radiotherapy: 10 Incidents

2 incidents with linear accelerators involved a geographical miss of the target area. In the first case, during the second fraction of a radical external beam treatment of the pelvis, the patient was not aligned correctly due to the couch being positioned incorrectly and received a dose of 1-1.5 Gy to the upper leg instead of the intended pelvic area. In the second case, a partial geographic miss of target volume resulted in 3 out of 5 fractions, with an estimated dose of 12 Gy, being delivered to an 8 cm extension of the treatment field.

2 incidents involved a repeat CT scan being performed during radiotherapy planning due to a positioning error. In each of these cases the scan was repeated as the original scan did not include an important reference point required for radiotherapy beam alignment. The two patients received additional doses of 3.1 mSv and 3.3 mSv respectively.

2 incidents involved the wrong area being treated using a linear accelerator. In the first case, a patient receiving palliative treatment for hip pain received a dose to an area of the pelvis not intended to be treated. A contributing factor that resulted in this incident was a radiotherapy equipment breakdown that caused the patient to move during treatment as they were in pain by the time the treatment commenced. The positioning of the patient was not re-checked resulting in a dose of about 4 Gy being delivered to an area outside the treatment region. In the second case, radiotherapy treatment of the left lung occurred rather than the right lung. This resulted in an additional dose to the patient of 39.6 Gy in 22 fractions.

2 incidents involved the wrong dose (lower than prescribed) using a linear accelerator. In the first case, a patient was prescribed a palliative external beam radiotherapy dose of 36 Gy to the brain. After 6 weeks an error was detected in the treatment prescription where the Radiation Oncologist incorrectly localised the treatment target, resulting in the patient receiving 33 Gy rather than the intended 36 Gy. In the second case, the motion interlock failed to detect a fault in the linear accelerator and caused the photon jaw to move during treatment. The treatment was terminated and was estimated to result in the patient receiving less dose than prescribed.

1 incident involved the wrong dose (higher than prescribed) delivered using a linear accelerator. The planning radiation therapist used a proposed treatment prescription rather than the actual prescription. This resulted in the patient receiving 10 Gy instead of 8 Gy.

1 incident involved a wrong dose (higher than prescribed) delivered using a superficial X-ray therapy unit. A patient received 60 Gy in 22 fractions instead of the prescribed dose of 50 Gy due to a calculation error. The error was caused by treatment planning calculations not being sufficiently checked.

Industrial Radiography: 7 incidents

2 incidents involved damage to an industrial radiography gamma camera due to falling from a height. In the first case, while an industrial radiographer was carrying out a source retrieval procedure, the gamma camera fell from a stand and the iridium-192 source could not be retracted into the shielded position for 2 hours. This resulted in the radiographer receiving an estimated dose of 1.4 mSv. In the second case, the gamma camera fell to the ground while being lowered from scaffolding using a rope. No person was exposed.

2 incidents involved industrial radiographers entering the exposure field during radiography. In the first case a communication failure resulted in two industrial radiographers being exposed to radiation when removing radiographic film while it was still being exposed to an industrial radiography source. The source was retracted to its shielded position after the accidental exposure. It was estimated that they each radiographer received a dose of 540 µSv in about 50 seconds. In the second case one member of a non-destructive testing team breached a barrier and was exposed to X-rays. The person's TLD monitor recorded a dose of less than 1 µSv.

1 incident involved an industrial radiography source becoming jammed in the delivery tube. An industrial radiographer failed to check that a delivery tube was 'kink free' prior to use, which resulted in the pigtail containing the radioactive source being jammed in the delivery tube. The two operators received doses of 4 mSv, and 350 µSv respectively.

1 incident involved a faulty industrial radiography source holder connection. An industrial radiography pigtail became dislodged in the collimator. After it was repaired the pigtail again dislodged from the wind-out cable. Personal monitoring reports indicated that the workers received doses of less than 0.13 mSv for the one month monitoring period.

1 incident involved the jamming of firing plugs of portable industrial radiography equipment. Three technicians were involved in jamming a four way pin into a five socket causing an industrial radiography X-ray unit to fire automatically under particular conditions.

High Recorded Dose: 5 Incidents

2 incidents involved a high dose recorded on personal radiation monitors that were scanned by airport baggage X-ray equipment. In the first of these cases, two personal radiation monitors received high doses of 5000 µSv and 3290 µSv respectively over a 3 month monitoring period. In the second case, a personal radiation monitor received a high dose of 8110 µSv over a 3 month monitoring period. In both cases the users had travelled overseas during the wearing period. It was concluded that the doses were uncharacteristic of the work undertaken and should not remain on the personal dose records.

1 incident involved a high dose recorded on a personal radiation monitor as a result of the monitor being left in close proximity to industrial radiography activity. A personal radiation monitoring report indicated that a monitor had received a dose of 1770 µSv over a one month monitoring period and that the estimated energy for the dose was 300 keV. An investigation of this incident found that the monitor may have been left in a vehicle in close proximity to considerable industrial radiography activity. It was agreed that the dose should remain on the person's dose record.

1 incident involved a high dose recorded on a personal radiation monitor as a result of the film falling from monitor holder and being exposed. The film fell out of the monitor holder of a linear

accelerator service engineer's film badge during operation of the linear accelerator and was exposed. The badge received a dose of 11 mSv over a 2 month monitoring period. There was insufficient evidence to conclude that the dose had not been received by the wearer and the dose remains on the wearer's personal dose record.

1 incident involved a high dose recorded on a personal radiation monitor as a result of the monitor being exposed to mail inspection X-ray equipment. A personal radiation monitor was in mail that passed through a mail inspection X-ray unit and recorded a dose of 72 mSv over a 3 month monitoring period. An investigation of this incident found that the high TLD reading was unlikely to have been a real exposure.

Borehole Logging: 3 incidents

2 incidents involved abandoned borehole logging sources. In both cases the logging tool became stuck at a depth while performing a reservoir evaluation during well-logging exploration. In both cases the source fishing operations were unsuccessful and the sources were cemented in-situ and abandoned. In the first of these cases, a 74 GBq caesium-137 source and a 684 GBq americium 241/beryllium source were abandoned. In the second case, a 63 GBq caesium-137 source and a 370 GBq americium-241/beryllium were abandoned.

1 incident involved workers being exposed to a radioactive source that had become detached inside a borehole logging tool. A 1.6 GBq cobalt-60 source became detached from the source holder inside a logging tool. The source holder was removed but the source remained inside the tool, which was transported in the passenger section of a truck. Two workers were exposed to a dose rate of approximately 600 μSv/h for 8 hours. They received doses of 2.71 mSv and 1.27 mSv on their personal radiation monitors.

Contamination: 2 incidents

1 incident involved contamination as a result of failure of equipment. After dissolution of an irradiated uranium target, the operator was purging off dissolver gas using helium. The noble gas trap ruptured which resulted in external contamination (clothing, hair and skin) to the operator and contamination of the floor of the working area from xenon-133 and krypton-85. No measurable dose was recorded. The radioactive contamination was measured as 500 counts per second on the floor and 100 counts per second on the clothing.

1 incident involved contamination due to human error. After removing shield plugs from a source, the active handler inadvertently contaminated their trousers. The handler did not monitor himself before leaving the work area and the contamination was detected at the exit of the containment building. The trousers were contaminated with manganese-56 and cobalt-56, with a count rate of approximately 2000 counts per second.

Laboratory: 2 incidents

1 incident involved exposure to a group of people from a contaminated laboratory. An engineer showed a group of people a disused laboratory, which was contaminated and in the process of being decommissioned. The owner did not authorise the people to enter the laboratory.

1 incident involved a source thought lost but later located. A sealed calibration source was thought to have been disposed in October 2003, yet remained on the inventory until January 2006. After searching, it was found that the source had actually been transferred in May 2000 to the contractor's waste store. The sealed calibration source, of unknown activity and radionuclide, was encased in a Perspex rod.

PDMG: 2 Incidents

Both incidents involved a portable density/moisture gauge being run over. In the first of these cases, a soil technician was conducting measurements and received a phone call in his car midway through the measurements. Upon completion of the phone call the technician forgot about the measurements and drove over the gauge. The gauge received only superficial damage and was able to be locked in its shielded position. In the second case, a soil technician undertaking a daily standard count moved his vehicle to allow the driver of a back hoe to pass. The back hoe passed the vehicle but in doing so ran over the gauge. The incident caused the source rod and body to become misaligned but the source rod did not cause an exposure as it stayed within the shielding.

Radiation Sources Lost: 2 incidents

1 incident involved a sealed radioactive source being lost. A cobalt-60 source, with an activity of approximately 400 kBq in 1987, had been used as part of a teaching set but was last used in 2003. The source became lost and remains unaccounted for.

1 incident involved a radioactive source being disposed of in general waste. A cobalt-57 anatomical marker, with an activity of approximately 7.4 MBq in 2005, was mistakenly disposed of in general waste and is now irretrievable. It was found that the marker had not been removed from a patient's body after a nuclear medicine study and the patient subsequently disposed of the marker as they exited the hospital.

Ultraviolet Radiation Exposure: 2 incidents

Both incidents involved overexposure of persons using UV transilluminators. In the first of these cases, a PhD student was analysing DNA bands using a UV transilluminator but forgot to wear a face shield. The student received superficial burns to the cornea from the incident. A later medical assessment cleared the student of any ongoing injury. In the second case, an honours student inadvertently left the polycarbonate shield of a UV transilluminator open for about 3 minutes. The student was not wearing a face-shield and received facial erythema.

Irradiator: 1 incident

An operator failed to engage a locking ring on an irradiator's sample chamber door, which resulted in the door not being fully closed when the column ascended. The micro switch was pushed out of alignment and some lead was scraped off the shield. No person was exposed.

Laser: 1 incident

A postdoctoral fellow and PhD student were aligning the position of a crystal, used for second harmonic generation, in the beam of a Class 4 laser. The crystal became inadvertently aligned such that the laser beam momentarily entered the eye of the PhD student. The incident resulted in permanent macular damage to the retina of the right eye of the PhD student, who now has a perceived blind spot of about 1 cm at the centre of vision.

Radiation Gauge: 1 incident

The shutter mechanism dislodged from a radiation gauge containing caesium-137, approximately 1.85 GBq. The main contributing factor was a sheared pin such that the body of the gauge would not lock into place. The gauge was installed several months before the problem was noticed. Details were not given of the number of people possibly exposed but the estimated exposure rate was 0.19 mSv per hour at 1 metre.

Radiation Sources Found: 1 incident

A radiation gauge containing caesium-137 of approximately 813 MBq was found in a safe at a mine. The mine had not been operational for many years and there was no known licensee for the gauge. It is believed that the gauge was used to measure slurry density at the mine. The gauge shutter was in the closed position so exposure would be limited.

Transport: 1 incident

A borehole logging source containing americium-241/beryllium of approximately 592 GBq was temporarily lost during transport. The source was found 10 m from the highway in a rural location. It was determined that the source was not strongly secured resulting in it becoming lost. Wipe tests showed no external contamination of the container.

Unauthorised Disposal of Radiation Source: 1 incident

An unlicensed person obtained ionizing radiation apparatus (at least 5) from an auction. One of the devices, an industrial radiography X-ray unit, was subsequently placed on eBay for auction. The listed item was withdrawn after a request from the radiation regulator.