Australian Government

Australian Radiation Protection and Nuclear Safety Agency

AUSTRALIAN RADIATION INCIDENT REGISTER (ARIR)

SUMMARY OF RADIATION INCIDENTS: 1 JANUARY TO 31 DECEMBER 2009

The total number of radiation incidents reported to the Register that occurred during the period from 1 January to 31 December 2009 was **98**. A summary of the incidents in each category is given below:

Diagnostic Radiology: 43 Incidents

15 incidents involved patients being given unnecessary/unplanned CT scans/radiology examinations due to mistaken identity. In seven of these cases, the mistaken identity was due to the incorrect identification of a patient by radiology staff due to procedural errors. In another six cases, the wrong patient identification label or name had been placed on the X-ray request form and in two cases the mistaken identity involved patients with the same surname. Across all cases, the patients received unintended doses ranging from approximately 26 µSv to 13 mSv. In all cases staff were reminded of the importance of following correct patient identification protocols and in some cases those protocols were updated.

9 incidents involved a CT scan or X-ray of a patient later found to be pregnant. In three of these cases, the patient was asked to have a pregnancy test but declined and subsequently found out some weeks later she was pregnant. In another three cases, the patient was asked and indicated she was not pregnant only to find out some weeks later that she was. In two cases, it is unclear whether staff checked the pregnancy status of the patient. The last case involved a patient who had a blood test for pregnancy but during the diagnostic procedures pregnancy was checked verbally rather than via the available test results. The patient indicated she was not pregnant but found out a month later that she was in fact pregnant. Across all cases, doses to the fetus ranged from 0.22 mSv up to 32.6 mSv.

7 incidents involving an unnecessary repeat CT scan given to the patient. Three of these cases involved CT scans not being archived to the PACS system or reported and subsequently deleted from the CT system. The patients received estimated effective doses of approximately 2 mSv, 9.3 mSv and 14 mSv respectively. Two cases involved a patient receiving a CT scan twice due to the request form being sent on two separate dates. The patients received doses of 3.4 mSv and 5 mSv respectively. Another case involved a patient undergoing two CT examinations on the same day, the first one being unnecessary. This resulted in the patient receiving a dose of approximately 1.5 mSv. The last case involved a CT scan of a patient being re-ordered instead of being discontinued, resulting in the patient receiving a dose of 10.4 mSv. In most cases protocols for checking patient and procedure details were reviewed and discussed with staff.

7 incidents involved unnecessary CT scan/radiology examinations. In the first case, a patient had unnecessary plain radiographs in addition to CT imaging, which provided the same information. The patient received an additional estimated effective dose of 2 mSv. In the second case, the patient received two unscheduled CT scans, resulting in an estimated total effective dose to the patient of 25 mSv. In the third case, a patient received two CT scans due to two request forms, each showing different clinical information, being sent on separate dates. The second scan was not required and resulted in the patient receiving an estimated dose of approximately 20 mSv. In the fourth case, a patient wrongly received a fluoroscopy X-ray procedure due to lack of communication. The procedure had been cancelled but staff were not

aware of the cancellation resulting in the patient receiving an estimated effective dose of approximately 10 mSv from the procedure. In the final case, a child was referred for an ultrasound of the hips but an X-ray was performed instead, resulting in the patient receiving an estimated effective dose of approximately 1.5 mSv. In a couple of cases the booking was made over the phone and staff have been reminded not to perform the procedure without sighting that actual referral. In the last two cases, the scans were due to misreading of request form. A patient who had been prescribed a plain diagnostic X-ray of the spine received a CT (10 mSv) examination of the spine instead. Another patient who had undergone a repair of an abdominal artery aneurysm underwent a CT pulmonary angiogram instead of a CT abdominal angiogram due to radiology staff not comparing the clinical information on the request form with the procedure booking. The patient received an estimated effective dose of 12 mSv.

3 incidents involved CT scans/radiology examinations performed on the wrong region of the patient. One of these cases involved a patient mistakenly being given a CT scan of the right shoulder instead of the left shoulder due to the radiographer losing concentration part way through preparing the patient for the scan. The patient received a dose of approximately 7.5 mSv to their right shoulder. The second case involved a patient undergoing a right-sided CT fluoroscopy guided nerve root block that should have been performed on the left side. The patient received an estimated effective dose of approximately 6.3 mSv. The hospital has since introduced a side marking protocol for interventional procedure. The last case involved a patient mistakenly receiving an X-ray of the chest instead of the prescribed abdomen due to the radiographer not confirming the procedure. The patient received a dose of 0.1 mSv.

2 incidents involved a patient receiving a higher than normal radiation dose during an interventional procedure. In the first of these cases, a patient had a coronary interventional procedure that involved fluoroscopy with long screening times and several image acquisition runs. This resulted in the patient receiving a total dose of approximately 6.8 Gy. The patient had an erythema reaction. The second case involved a patient undergoing mesenteric embolisation angiography using a combination of high frame rates, long screening times and several image acquisition runs. The procedure resulted in the patient receiving a dose of approximately 15.5 mGy.

Nuclear Medicine: 27 Incidents

9 incidents involved the wrong scanning agent/radiopharmaceutical being given to the patient. Most of these cases were due to human error. Six of these incidents were caused by staff not correctly checking labels on lead pots, vials or drawn up doses. The doses administered were between 0.89 mSv and 6.2 mSv. In one case the request form was misread when the test was booked. The test ordered was a very infrequent one and the patient was subsequently booked for a commonly used test that had two phases and resulted in a total unnecessary dose of 14.88 mSv. In another case the technologist was in a hurry and grabbed the wrong dose from two made up in the hot lab. The final case involved the technologist selecting the wrong cold kit and thus making up the wrong radiopharmaceutical. The practice had recently changed supplier and the colour coding of the new products was different from the previous coding.

5 incidents involved the radiopharmaceutical being administered to the wrong patient. Of the five cases, two involved the doses for patient doses being swapped. In one of these cases a child received a dose of 6.2 mSv because the technologist did not check the patient identity. In the other case two adults both received the wrong pharmaceuticals resulting in doses of 3.4 mSv and 4.2 mSv respectively. One case involved an incorrect patient label on the request form so, although the technologist did check the identity of the patient, the wrong person received the test. In another case a patient answered to someone else's name when called in the waiting room. The final case was caused by miscommunication between staff. In most of the departments involved staff have been reminded of the correct procedures for checking patient identity.

4 incidents involved unnecessary dose being administered to the patient. In two cases the patient was intended to have a bone mineral density study (DEXA) rather than a bone scan resulting in extra doses of 1.8 and 4.8 mSv. In another case there was miscommunication with regard to two phases of a study and the patient only received half the required dose and it therefore had to be repeated. In the final case there was miscommunication between the Nuclear Medicine and Cardiology departments and the patient subsequently received a cardiac scan unnecessarily.

3 incidents involved the administered radiopharmaceutical not being able to be used for diagnosis. In two incidents the injected substance failed to show diagnostic information due to inadequate 'labelling' of the radiopharmaceutical. In one of these cases, it was believed to be a faulty batch of the pharmaceutical and in the other it appeared to be due to the operator failing to note that the radiopharmaceutical did not pass QC tests. Doses of 12 mSv and 10.8 mSv respectively were received by the patients. The third case involved an un-diagnostic dose as a result of a patient receiving the radiopharmaceutical in the wrong phase of a study. The requirement for checking they have the correct patient, the stage of studies and all labels was reinforced to staff.

3 incidents involved a spill of radiopharmaceutical. In two of these cases the spill happened during a procedure due to a failure in the seal of connecting tubing to a tap or syringe. In both cases small amounts of iodine-131 were spilt on equipment, the floor and the clothes and shoes of staff. Maximum doses to staff were in the order of 0.2 μSv. Protective plastic sheets were disposed of after appropriate decay periods and all areas were thoroughly decontaminated following the procedure. In the other case some gallium-67 was spilt onto the operator's glove and shirt cuff during routine drawing up of the solution. This was believed to be due to a faulty vial cap. The operator washed their hands and sleeve thoroughly which was enough to remove contamination.

1 incident involved radioactive waste being disposed of with non-radioactive waste. Some radioactive waste was inadvertently disposed of with non-radioactive waste because a new cleaner accessed a restricted laboratory and removed bags that were waiting to be sent to the appropriate storage area. The radioactive waste is usually stored until decayed sufficiently to be sent to landfill. The hospital has strengthened training for new staff and updated protocols for laboratory access control.

1 incident involved radioactive waste being released to the sewer without undergoing the recommended decay period. Some iodine-131 contaminated wastewater was released directly into the sewer when switching to delay-and-decay tanks was overlooked. Just less than 3 GBq of iodine-131 was inadvertently released over a period of 27 hours. Although the average monthly and annual discharge limits were unlikely to be exceeded, it was above the activity concentration limit for that period. Protocols have been revised to include two persons signing off that switching of plumbing has been done.

1 repeat CT scan was required due to a software fault. Whilst a patient was undergoing the CT part of a SPECT/CT examination the CT scanner developed a fault and the computer had to be rebooted. A repeat CT scan with a dose of 10 mSv was required. The scanner manufacturer was informed of the software fault.

Radiotherapy: 11 Incidents

4 incidents involved the wrong area being treated using a linear accelerator. In the first case, a patient received 17 out of 30 fractions to the wrong side resulting in an estimated dose of 34 Gy. This was due to an error on treatment notes and the patient's full notes not being present when treatment cross checking occurred - procedures have now been modified. In another case the patient received the first of 20 fractions to the wrong side resulting in an inadvertent dose of 2.4 Gy. The treatment isocentre was incorrectly recorded in the chart of another patient resulting in a beam misplacement of 20 cm. Two Gy was delivered to the posterior chest instead of the

abdomen. The last case involved a dose of 3Gy being delivered to normal tissue (no body area was described in the report).

3 incidents involved the wrong dose (higher than prescribed) delivered using a linear accelerator. 72 patients received a dose approximately 4.8% higher than prescribed due to an incorrect cross-calibration factor being obtained during commissioning of the linear accelerator. Action has been taken to prevent occurrence of similar incidents - each time a new linear accelerator is commissioned or annual testing done, the calibrations will be checked by a second qualified physicist using different equipment. In another case, a patient received two fractions higher than prescribed due to filters not being in place. The total prescribed dose was not exceeded as the treatment was halted. This incident occurred due to an error in transcription and functional differences between makes of linear accelerators also contributed to the problem. A man received a dose to his prostate that was higher than prescribed because of a mix up between two patients both being treated for prostate cancer. The incident occurred due to miscommunication between therapists.

1 incident involved a repeat CT scan being performed during radiotherapy planning. A simulation CT was performed on the wrong area of the spine resulting in an unnecessary dose of 33 mSv. This was caused by the request form being incorrectly filled out – with the thoracic spine being identified rather than the lumbar.

1 incident involved a geographical miss using a brachytherapy applicator. A uterine applicator was meant to be positioned centrally within the uterus but was incorrectly placed outside the uterus against the lateral wall. A dose of 3.5 Gy was delivered. Practice improvements have been implemented to include scheduling of Radiation Oncologist cover to review pre-treatment scans and confirm applicator positioning.

1 incident involved displacement of brachytherapy pellets. A patient was being treated using low dose rate brachytherapy and the catheter containing the caesium-137 pellets inadvertently dislodged whilst the patient was asleep. The catheter was found lying against the patient's side which could have caused damage to the skin depending on how long it had been there. The sources were retracted into the safe immediately upon detection of the problem so there were no doses to staff. Visual checking of the catheters on a 3-4 hourly basis during the night has been introduced.

1 incident involved exposure of staff due to operator error. Two staff members were briefly exposed in a planning CT room due to the failure of the operator to select a scanning delay option. The exposure was quickly terminated and doses were estimated at less than 0.5 mSv.

Borehole Logging: 4 incidents

1 incident involved a broken glass chamber containing tritium within a borehole logging tool. A rattling noise was noticed when using a prompt fission neutron (PFN) logging tool. The operator dissembled the tool after depressurising it in the open and found that the internal glass chamber was cracked. Based on tests conducted by the manufacturer, less than half of the tritium would have escaped during the depressurisation. Wipe tests confirmed there were no contamination issues.

2 incidents involved borehole logging sources lost in holes and later recovered. One borehole logging source containing 3.7 GBq of caesium-137 fell to the bottom of a 15m hole because the bull plug was not properly attached. A retrieval tool was manufactured and the source successfully retrieved. More robust procedures for checking bull plug attachment prior to use of the tool have been implemented by the company. In the other case a 2.2 GBq cobalt source became trapped and the wire line sheared. A camera system was used to assess the situation and the source was later recovered undamaged.

1 incident involved logging tools becoming stuck in holes and needing to be abandoned. Two radiation sources on logging tools (both of cobalt-60) became lodged in drill-holes with cables still attached. In both cases, fishing attempts were successful and the logging tools and sources were recovered without damage or dose to workers.

Industrial Radiography: 3 incidents

1 incident involved contamination of industrial radiography guide tubes. Three guide tubes for gamma cameras became contaminated with iridium-192. The source of the contamination could not be identified as the radiation sources within the cameras appeared to be intact. Other companies using the same equipment have been notified to check their equipment and the manufacturer has been asked to provide information on possible causes.

1 incident involved exposure of personnel due an industrial X-ray unit firing automatically. One organisation reported that they had had several instances where X-ray units had fired whilst personnel were nearby (minimal exposures). Investigation found that this was because the operators had forced a 5 pin plug into the wrong socket (4 pin) when connecting the systems. The cables have now been colour coded so the correct plugs can be identified.

1 incident involved a barrier breach during open field radiography. Radiographers were just setting up the equipment and exposures had not started when a person entered the area. Better procedures for placing notices around the site have been developed and sentries will be used to monitor roadways.

High Recorded Dose: 2 Incidents

1 incident involved an unexplained high dose on personal radiation monitor. An unexplained high dose of 5.5 mSv in 3 months was recorded on the personal radiation monitor of a laboratory worker. Colleagues alongside and performing similar work did not receive the same dose. Investigations including thyroid monitoring and electronic dosimeters concluded it was unlikely the person received the exposure.

1 incident involved high doses on extremity radiation monitors. Two persons performing calibration of air monitors recorded up to 284 mSv on finger monitors in a one month period. Whole body TLD readings and electronic dosimeters were within normal ranges. Investigation showed it could have been due to a new one-off procedure. The type of duties for the person receiving the high finger doses has been restricted for the next year.

Radiation Gauge: 2 incidents

1 incident involved mechanical faults with radiation gauges. A mining company reported that two gauges had developed faults – one had a sloppy shutter mechanism and the other had an external part fallen off. There were no injuries and no exposures to radiation.

1 incident involved contamination of a source capsule and gasket of a radiation gauge. A manufacturing company reported that contamination with americium-241 had been found on a gauge at its annual inspection. No external leakage had been detected on the gauge housing. This gauge is used in a hostile environment and external corrosion had been reported at last inspection. The gauge was repaired and decontaminated and put back into service. Wipe tests are being done monthly until the source can be replaced.

PDMG: 1 Incident

1 incident involved cracked welds on a portable density moisture gauge (PDMG). During a routine check a crack in the weld between the source holder and source rod was noticed. Radiation levels around the gauge were normal. The gauge manufacturer was contacted and they advised that a small percentage (less than 1%) had reported this problem. Other users were advised to check for cracks as part of routine cleaning.

Cabinet X-ray: 1 incident

1 incident involved a worker being exposed during maintenance of a cabinet X-ray unit. A security officer was performing routine maintenance in the chamber of an X-ray unit when a colleague started the unit momentarily (dose (less than 40 µSv). A screen blocking the view of the operator has been moved and more defined procedures regarding maintenance have been provided.

Radiation Sources Found: 1 incident

Old low level radium-226 and Krypton-85 sources were discovered in a warehouse. The cause appears to be that legacy sources had been forgotten over time due to inadequate record keeping and change-over of personnel.

Laser: 1 incident

A person was exposed to radiation from a target designator (class 4 laser) whilst using viewing aids. New operating procedures were introduced including a requirement to call a warning prior to firing the laser.

Theft of Sources: 1 incident

A PDMG (in transport case) was found to be missing from a locked but isolated storage location. The gauge had been used as part of a short–term infrastructure project and had not been sighted for several months. The last user was no longer employed by the company and an extensive search failed to locate the gauge. Police were notified as it was presumed that the gauge was stolen.

Sources Lost: 1 incident

Ten iodine-125 seeds were used in an eye applicator in a radiotherapy department. When preparing for the next use it was found that one was missing. An extensive search could not locate the source and it was assumed that it had been washed down the drain during cleaning. A fine strainer has since been fitted to the sink.