Australian Government

Australian Radiation Protection and Nuclear Safety Agency

AUSTRALIAN RADIATION INCIDENT REGISTER (ARIR)

SUMMARY OF RADIATION INCIDENTS: 1 JANUARY TO 31 DECEMBER 2008

The total number of radiation incidents reported to the Register that occurred during the period from 1 January to 31 December 2008 was **108**. A summary of the incidents in each category is given below:

Diagnostic Radiology: 42 Incidents

15 incidents involved patients being given unnecessary/unplanned CT scans/radiology examinations due to mistaken identity. In several cases patients (some elderly or confused) responded to the wrong name; three cases of mistaken identity involved patients with the same or similar names; another where the radiographer did not print a copy of the request slip and relied on memory. A number of cases involved the radiographer not confirming identity of patients: one where the patient was collected from a particular station and the staff member did not realise that the patient had changed; another where they did not check or clarify patient's ID after the nurse mistakenly brought them the incorrect patient. In another case, the patient supplied the correct name to the CT assistant; but the assistant did not pass it to the radiographer. In most of these cases staff did not follow proper procedures to identify patients and many of the practices/hospitals involved have reviewed protocols and provided refresher training to staff. Extra, unnecessary doses to patients ranged from 0.05 mSv to 60 mSv.

10 incidents involved an unnecessary repeat CT/radiology examination. Three cases involved the picture archive and communication systems (PACS): two where the radiographer or doctor failed to check the patient's imaging history; another where images were deleted before being saved to PACS. Two incidents occurred due to a breakdown of communication. In the first, the radiographer did not complete all necessary scanning procedures and protocols on the patient before finishing his/her shift - nor inform the next radiographer that this had not been done. In the second case, the request slip was first faxed then delivered in person to the Medical Imaging Department. Two other cases resulted from human error when staff simply misread the request forms. In one incident, the radiographer was unaware of a protocol change; this resulted in a patient having CT instead of a SPECT/CT. Another repeat was caused by the contrast media not going into a patient (3 way tap to inject IV not used properly). Extra, unnecessary doses to patients ranged from 5.8 to 42 mSv.

7 incidents involved a CT scan or X-ray of a patient later found to be pregnant. In two cases, it was unclear whether medical staff asked the patient if she was pregnant. In another two cases, the patient was asked and indicated she was not pregnant only to find out some weeks later she was. β-HCG tests returned negative results in two emergency/trauma cases. One non-English speaking lady was breast-feeding and so it was assumed she was not pregnant however it was identified during the scan that she was. Across all cases, doses to the foetus ranged from 0.75 mSv up to 34 mSv.

3 incidents involved the incorrect patient being examined due to wrong label on request form. In one case a patient received 6 unintended plain X-ray exposures with a total dose up to 50 µSv. In another case a patient received 3 mSv from a CT brain, whilst in a further case the patient underwent an unnecessary abdomen/pelvis CT with both oral and intravenous contrast.

3 incidents involved unnecessary CT scans due to unclear requests. One case involved the general radiographer incorrectly instructing the CT radiographer that a CT scan was required. The second case involved the referrer's instructions being ambiguous consequently the CT scan was done 5 months ahead of schedule. Doses to the patient were 2.8 and 7.5 mSv, respectively. A further incident occurred when the referrer used the wrong form (radiology rather than nuclear medicine) and the patient received a CTPA (chest CT) rather than DTPA (renal nuclear medicine) scan.

2 incidents involved doses to staff because procedures were not followed. In both cases nurses failed to heed warning signs and entered CT rooms while scanners were in warm-up or QA test mode. Potential doses to the staff members were in the order of 27 and 75 µSv.

2 incidents involved the wrong area of the body being examined. A patient received a lumbar spine CT instead of a cervical spine CT in one case. In another, the right shoulder instead of the left shoulder was X-rayed. Extra doses were 19 mSv and 0.16 mSv, respectively.

Nuclear Medicine: 31 incidents

15 incidents involved the wrong scanning agent/radiopharmaceutical being given to the patient. In 7 cases, the staff selected the wrong dose and administered it to the patient. Causes included: time constraints, not reading the label, wrong coloured lid on a vial and keeping more than one dose in the same place. Patients required rescans leading to unnecessary doses ranging from 3.16 to 10 mSv. Three cases were caused by a breakdown of communication: two cases where the referrer's writing was difficult to read and then misinterpreted; another where a telephoned request was misinterpreted by the clerk. Dose to patients ranged from 0.013 to 10 mSv. Five incidents involved incorrect labelling of radiopharmaceutical-containing items – either lead pot or syringes - causing unnecessary patient doses of between 4 and 8.47 mSv. In another case the outer labels (from two radiopharmaceutical shielded packages) had been transposed during wrapping and handling at the dispensing facility. This resulted in a 12.5 mGy dose to one patient however the problem was identified before the second patient was injected.

6 incidents involved the administered radiopharmaceutical not being able to be used for diagnosis. A patient (already injected with radiopharmaceutical) went home despite being told to remain for a scan. The patient required a further administration resulting in extra dose of 5.1 mSv. In another case, the administering physician injected the radiopharmaceutical into the wrong tube. Unnecessary dose to the patient was 3.8 mSv. Two patients were injected with a radiopharmaceutical but could not be scanned due to failure of the bed gantry system - dose to patients was 6 mSv each. One patient received an unnecessary dose of 14 mSv although an exact cause was not determined - believed to be either incorrect administration to the tissue rather than the bloodstream or incorrect labelling of the pharmaceutical. Six patients required rescans after the injected radiopharmaceutical returned no diagnostic information possibly due to a faulty batch of the HDP bone agent (several other centres reported similar defects). In another case involving four patients the MDP agent was not present suggesting an empty vial being supplied. Extra patient doses were 10 to 11 mSv.

4 incidents involved the radiopharmaceutical being administered to the wrong patient. In three cases, medical staff placed the incorrect patient label on the request form. This resulted in doses (3.7-10.58 mSv) administered to the wrong patients. Another case was due to mistaken identity. A patient answered to a name called in the waiting room and also answered 'Yes' to other questions re date of birth and previous scans. The unnecessary dose to the patient was 4.5 mSv.

3 incidents involved the wrong dose being administered to the patient. All cases appeared to be caused by human error when preparing or administering doses: one where the Radiopharmacist did not enter the weight of the paediatric patient to the dispensing system (which automatically defaulted to standard adult weight); another where the technologist only checked the colour code of the vial - not the activity; another where staff did not read the dose label before injecting the patient. These resulted in extra patient doses of between 3.16 and 5.4 mSv.

1 incident involved a spill of radiopharmaceutical. The entire radiopharmaceutical spilled on the patient's gown and stretcher requiring decontamination. Deficient extension tubing which detached from the cannula appeared to be responsible and was later modified to prevent further incidents.

1 incident involved administration of a radiopharmaceutical to a pregnant patient. The patient had been asked whether she was pregnant prior to the procedure and stated she was not. It was later found that she had been pregnant at that time.

1 incident involved the wrong therapeutic radiopharmaceutical being administered. A palliative therapy dose was delivered to the liver and spleen rather than the skeleton following the administration of an incorrect radiopharmaceutical. The correct agent was administered later.

Radiotherapy: 10 Incidents

3 incidents involved the wrong dose (higher than prescribed) delivered using a linear accelerator. A patient was prescribed 36 Gy to be delivered in 18 fractions. Instead, the patient received 4 Gy over 16 fractions resulting in a total dose of 64 Gy. The cause stemmed from an error in manual planning calculations which were not picked up by checking or the record/verify process. In another case (using electron beam therapy) the fraction varied by 5% for two patients due to a malfunction in the control of the beam at one energy. In the third case, 4, 8 and 4 Gy respectively were prescribed but 8 Gy instead of 4 Gy was administered to the first site outlined in the treatment plan. Additional dose to the site was 4.34 Gy.

3 incidents involved incorrect CT scans as part of treatment planning. In one case, a normal rather than flat bed was used; in the second case, the patient was placed in a prone rather than supine position; and in the third case the scan was performed without the requested contrast media. In each case the patient had to be rescanned. Unnecessary doses to patients were 3.4 mSv, 1.7 mSv and 7 mSv respectively. Causes were due to human error: in the first case, the technologist performing the CT did not read the work sheet; in the others, the lack of experienced staff led to correct protocols not being followed.

2 incidents involved a geographical miss of the target area. In one case, the first of five fractions was delivered 8.5cm from the intended target and resulted in an unintended dose to an 8.5cm strip of normal tissue. An additional fraction of 4 Gy was prescribed to compensate to ensure that the planned area received the full dose of 20 Gy. In the second case, an 8 Gy dose was to be delivered over two fields however the geometry of one field was incorrectly defined by 2cm. This resulted in small areas being under-dosed by 50% and some over-dosed. No extra tissues were exposed and the patient showed adequate palliation.

2 incidents involved possible doses to members of the public. In the first case, a trench was being excavated outside a linear accelerator treatment room which could have affected the shielding. Operators became aware of the problem early on so potential doses to the public and electricity workers were averted. In the second case, an after-hours relief cleaner entered a treatment room while the linear accelerator was operating during maintenance work. The cleaner could have received

up to 65 μGy skin dose. The hospital identified that this was a potentially serious incident and agreed that all recommendations of the incident report must be implemented.

Industrial Radiography: 6 incidents

3 incidents involved the pigtail becoming detached from the wind-out cable. In most cases, this was due to operator error. For example - an inexperienced trainee incorrectly connected the wind-out cable and the operator failed to properly check equipment prior to exposure. Maximum doses calculated to the operators were between 0.4 mSv and 2.8 mSv.

2 incidents involved the pigtail becoming jammed. In one incident; the pigtail became jammed after exchanging sources between two containers. After being recovered, the wind-out cable and guide tube were found to be fit for service. Exposures to personnel from the incident ranged from 0 to 240 μSv. In the second incident, a radiograph was conducted on a scientific apparatus whose electromagnets jammed the pigtail. Once the scientific apparatus' electromagnets were switched-off, the pigtail was able to return to the camera. The maximum dose to exposed personnel was 56 mSv.

1 incident involved an industrial radiographer entering an enclosed site during an exposure. A sole radiographer, thinking the exposure was complete, entered a partially enclosed site during an exposure and exchanged the film (for 1 or more minutes) before noticing he was directly in the primary beam. The radiographer did not follow safety procedures: was not wearing a personal alarm dosimeter, nor carrying a survey meter. No assistant was present, and the equipment did not have an audible alarm. The incident was not identified until the employer was notified of a high dose (64.86 mSv). The operator was retrained on safe work practices and the employer conducted necessary reporting requirements.

Borehole Logging: 5 incidents

4 incidents involved logging tools becoming stuck in hole and needing to be abandoned. In two cases, the installed radiation sources on the logging tool were caesium-137 and americium-241/beryllium. The other two cases had logging tools with three caesium-137 sources and a pulsed neutron generator (with a tritium source). In all cases, fishing attempts were unsuccessful and the logging tools - stuck at depths between 1327m and 4394m - were deemed unrecoverable, cemented in-situ and abandoned.

1 incident involved a source stuck on the logging tool. A caesium-137 (approx. 38 GBq) source became stuck on the collar of the tool. It was covered with an emergency shield (Type A package) and then removed according to response plan. Maximum dose rates were 66 μSv at the surface and 9 μSv at 1 metre.

High Recorded Dose: 4 Incidents

3 incidents involved personal radiation monitors incorrectly worn or stored. In one case, 3 personal radiation monitors recorded high doses because they were worn incorrectly – swapping collar and trunk positions. In the second case, a new employee had stored a personal radiation monitor in a high background area. In the third case a monitoring badge was stored attached to a lab coat on a rack next to a radioactive waste bin. It is also possible a small amount of iodine 131 was spilt on the badge.

1 incident involved unexplained high doses on personal radiation monitors. Three staff members recorded reportable personal radiation doses despite being on leave during the wearing period. A possible cause may be X-ray screening during cargo shipment but this cannot be confirmed.

Sources Lost: 2 Incidents

1 incident involved sources old disused gauges being disposed with scrap metal. Two 3.7 GBq americium-241 sources in disused fixed radiation gauges (each contained in a welded, stainless-steel encapsulation) had inadvertently been thrown out as scrap metal. Despite an extensive search at the recycling facility the sources were not found.

1 incident involved the loss of three low activity marker sources. Three low activity barium-133 sources (activity of 1.5 MBq each) were lost from a hospital. It was thought that they may not have been removed from a patient prior to going home. The patient was contacted but the sources not located. It is possible the sources may have been discarded when the patient was getting dressed.

Theft of Sources: 2 Incidents

In the first case, thieves broke into a fenced building site overnight stealing all tools from more than one locked container; the soil moisture/density gauge (PDMG) did not appear to be singled out. In the second case, a handheld X-ray Fluorescence Analyser (XRF) was apparently stolen when not stored securely during a lunch break. In both cases, police and the regulatory authorities were notified.

Laser: 1 incident

1 incident involved a potential eye strike from a laser. A member of the public aimed a laser pointer at a pilot. The pilot was cleared of eye damage and police are investigating the incident.

Luminising/Luminous Device: 1 incident

1 incident involved damaged Gaseous Tritium Light Sources (GTLS). Two GTLS in a piece of equipment were found to be cracked. As the tritium contained inside would have already vented to the atmosphere, measured doses/exposures to personnel from the gas would be negligible.

PDMG: 1 incident

1 incident involved a PDMG being run over. A grader driver backed over a soil moisture and density gauge which was left unattended. In response, safe work method statements were reissued and refresher training provided to staff. The gauge was not damaged and there was no uncontrolled emission of radiation.

Radiation Gauge: 1 incident

1 incident involved malfunction of a fixed radiation gauge. A mechanical micro-switch on an industrial radiation gauge failed causing the shutter to remain fixed in the closed position. The switch was replaced and a system implemented to perform additional, routine checks of the device.

Sources Found: 1 incident

Old dials with radium paint were discovered in a cupboard by some scientists. The cause appears to be that legacy dials had been forgotten over time due to inadequate record-keeping.

Ultraviolet Radiation Exposure: 1 incident

Two PhD students were exposed to high levels of UV radiation. Both reported eye damage and one displayed evidence of skin damage. The control system of a Class 2 Biological Safety Cabinet had been malfunctioning for some time and there were no safety interlocks installed on the unit.