Radiation Act 2005

Annual report for the financial year ending 30 June 2012
## Contents

- Introduction .................................................................................. 2
- About the Radiation Act ................................................................. 3
- Activities of the Secretary ............................................................... 4
- Inspection program ......................................................................... 5
- Prosecutions .................................................................................. 6
- Review of enforcement and compliance activities ......................... 6
- Solaria ............................................................................................ 7
- The physical security of high-consequence radioactive material ...... 8
- Disposal of radioactive material ....................................................... 10
- Education sessions ........................................................................ 11
- Emergency response service .......................................................... 11
- Review of Victoria’s preparedness to respond to incidents involving radiation .......................................................... 11
- Authorised officer training ............................................................... 12
- Ongoing participation on the National Radiation Health Committee .......................................................... 12
- The Victorian Public Health and Wellbeing Plan .............................. 13
- Review of all management licences ................................................. 14
- Mandatory reporting of radiation incidents ..................................... 15
- Management licence exemptions ..................................................... 16
- Improvements to the licensing application process ....................... 16
- Public use licences register ............................................................. 17
- New website .................................................................................. 17
- Improved data reporting and analysis ............................................. 17
- Summary of authorities issued by the department ......................... 18
- Radiation incidents ........................................................................ 19
- Appendix: Incident summaries ......................................................... 20
- Common acronyms and initialisms .................................................. 43
- Helpful resources .......................................................................... 44
Introduction

The first provisions in the Victorian Health Act relating to radiation safety were introduced in 1961, with radioactive substances being defined as a ‘dangerous substance’.

Until approximately 1983/4, radiation safety was administered via the predecessors to the Department of Human Services (Health Department Victoria and Health Commission Victoria) through its Occupational Hygiene Branch. From 1983/4 a specialist radiation safety team was created and this type of team has continued until today.

Radiation is used in many areas of medicine, industry, research and education. Used safely, it has a great many benefits to our community. Protecting Victoria and its people from the harmful affects of radiation remains an important role of the state government.

To assist with transparency, s.134 of the Radiation Act 2005 requires that the Secretary to the Victorian Department of Health must publish an annual report that:

• describes the activities of the Secretary in relation to radiation safety under the Act
• includes a summary of all authorities issued, renewed, suspended, cancelled, varied, transferred or surrendered during that year
• includes all radiation incidents investigated in that year
• includes a summary of all prosecutions for offences against this Act or the regulations commenced in that year
• includes any other prescribed matter.

This Radiation Act 2005 annual report for the financial year ending 30 June 2012 fulfils this requirement, describing the activities of the Secretary to the Department of Health in 2011–12.

Within the department, the radiation safety functions are administered through the Environmental Health Regulation and Compliance Unit of the Health Protection Branch. This branch is located in the Wellbeing, Integrated Care and Ageing Division.
The Radiation Act came into law on 1 September 2007. It gives effect to Victoria’s commitment to the National directory for radiation protection (NDRP), which outlines a common approach that must be undertaken by Commonwealth, state and territory governments for managing radiation protection.

The purpose of the legislation is ‘to protect the health and safety of all persons and the environment from the harmful effects of radiation’ and incorporates:

- the radiation protection principles (found in the NDRP)
- a requirement for the Secretary to the Department of Health to adhere to both the radiation protection principles and the NDRP
- the concept of licensed activities, particularly the licensing framework created by the Act, including
  - management licences to authorise the conduct of radiation practices (such as possession of a radiation source)
  - use licences to authorise a natural person to use a radiation source
  - radiation facility construction licences (this provision has not yet been activated via a regulation)
- the concept of approved testers and the testing of prescribed radiation sources against declared radiation safety standards.

The Act creates several significant offences for:

- conducting a radiation practice without a management licence (the maximum penalty in the 2011–12 period for a body corporate for this offence was $1,099,260)
- using a radiation source without a use licence (the maximum penalty in the 2011–12 period for an individual for this offence was $146,568)
- failing to comply with the conditions of a licence (the maximum penalty in the 2011–12 period for a body corporate for this offence was $732,840).
Activities of the Secretary

During the 2011–12 financial year the key activities of the department regarding radiation safety were:

• continuing to improve the department’s visibility through an inspection program
• an ongoing monitoring and compliance program for solaria
• ongoing implementation of a national code of practice related to physical security of radioactive material including endorsing transport security plans
• implementing the outcomes of a review on disposing of radioactive material
• providing education sessions to stakeholders
• continuing to deliver an emergency response service
• developing and delivering accredited training for departmental staff
• including radiation safety content into the Victorian Public Health and Wellbeing Plan
• reviewing all management licences and the department-initiated variations to those licences
• revising mandatory requirements for incident reporting for management licence holders
• revising exemptions from the requirement to hold a management licence
• reviewing enforcement and compliance activities
• implementing administrative improvements such as publishing a register for use licences, a new radiation website, improved data analysis and reporting, and developing and implementing new use licence application ‘smart forms’
• completing a project to review Victoria’s ability to respond to emergencies involving radioactive material
• ongoing participation on the National Radiation Health Committee.

These activities are discussed in detail later in this report.

The department also provides advice to the community on numerous radiation health aspects of ionising and non-ionising radiation sources. Non-ionising radiation sources include ultraviolet radiation, lasers, radiofrequency (RF) radiation, powerlines, mobile phones and communication towers. However, communications bands of the RF spectrum, including those used by mobile phones and communication towers, are regulated by the Australian Communications and Media Authority (ACMA).
Inspection program

A total of 887 inspections were conducted in the 2011–12 financial year.
Inspections were conducted of most types of radiation practices including: medical practices using computed tomography (CT) scanners or nuclear medicine; veterinary practices using either X-ray units for diagnostic radiography or in a few cases of practices using sealed radioactive sources for radiotherapy; dental practices; and solaria.

An inspection program was implemented in relation to medical practices using CT scanners. The program assesses the compliance of such licence holders against their obligation to justify CT procedures, to optimise CT procedures, to have a program in place that enables dose information to be compared with available diagnostic reference levels, to develop a radiation management plan, to have a system in place to ensure patients are correctly identified, and to have a protocol in place to make sure the pregnancy status of a patient can be established.

Where licensed practices did not comply with the conditions of licence and other legislative requirements, repeat inspections by the authorised officers were carried out to ensure these practices corrected any deficiencies highlighted during the initial inspection.

About Diagnostic Reference Levels

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) are managing the Australian National Diagnostic Reference Level Survey. The survey aims to gather individual practice data that will be collated and used to establish National Diagnostic Reference Levels for common diagnostic imaging procedures.

The survey will establish a measure of indicative doses for current diagnostic imaging practices across Australia. This will allow individual practices to compare their doses against those of their peers.

Diagnostic reference levels in this context are intended to help radiation practices manage their use of CT scanners so that they deliver the minimum radiation dose necessary to answer the clinical question. For more information about diagnostic reference levels see <http://www.arpansa.gov.au/services/NDRL/index.cfm>
Prosecutions

No prosecutions were commenced or conducted during 2011–12.

However, enforcement action was required in relation to one management licence. This action was initially triggered by changes relating to disposing of radioactive material and eventually resulted in the management licence being cancelled.

Review of enforcement and compliance activities

The department undertook a review of enforcement and compliance activities across its environmental health activities in 2011–12, which included the administration of the Radiation Act.

The review identified a number of opportunities for improvements that will now form part of the work plan for the 2012–13 year and beyond.

These opportunities included:

- developing a better defined regulatory policy framework including a risk- and culpability-based enforcement approach that can be applied to achieve a consistent approach to enforcement that is well understood by licence holders and other stakeholders (this project has commenced)
- an increased focus on communication with stakeholders
- a continued focus on system improvements and improvements to the licensing of radiation practices to reduce complexity wherever possible (significant progress has been made since the review was conducted and is discussed later in the report)
- improved training for technical staff to assist them in matters such as investigation techniques and enforcement (the training program is discussed elsewhere in the report).
Businesses operating solariums must be authorised by a management licence issued under the Act. The conditions of licence require solaria to:

- exclude people under the age of 18 from using the units
- exclude people with skin type 1 (pale skin) from using the units
- supervise all exposures
- ensure that staff are appropriately trained
- display warning notices regarding UV exposure
- obtain informed consent from all clients
- confirm proof of age prior to a client signing the consent form.

During the 2011–12 financial year 172 inspections of solaria were conducted. At the time of publication of this report, there were 131 licences issued to businesses to operate solaria at approximately 140 sites.

Compliance with the mandatory requirements has been extremely high. The one exception has been with the requirement to check proof of age before allowing a person to sign the consent form.

In April 2011 the department introduced a mystery shopper program using authorised officers as prospective clients to test solaria operators’ compliance with the requirement to check proof of age documentation.

To date, 147 mystery shopper inspections have been conducted, with 91 having passed and 56 having failed.

Many of the failures were believed to be related to confusion about the requirement to view the proof of age document before allowing the client to sign the consent form. Follow-up letters have been sent to these businesses confirming their requirements. The mystery shopper program will be reviewed once all the premises have been tested.

The department’s authorised officers have, however, noted that in many of these businesses that the operator was able to demonstrate that they were confirming proof of age before allowing the client to use the tanning unit e.g. by demonstrating the records kept by the business such as a copy of proof of age of clients.

The New South Wales Government announced that it intends to introduce legislation to ban commercial tanning units, effective from 31 December 2014. The department will continue to monitor this issue.

Although falling outside of the period of this annual report, it is important to note that the government released the Draft skin cancer prevention framework 2012–2016 in late July 2012 seeking comment to help shape skin cancer prevention in Victoria over the next five years and beyond. The draft framework proposed that the government would examine the regulatory impact of:

- a potential ban on solaria
- strengthened regulation
- the status quo.

The period of comment for the draft framework closed at the end of September 2012.
Radioactive material is used in many areas of medicine, industry, research and education. In the past, the focus of legislation controlling the use of radioactive material has been confined to protecting workers, the public and the environment.

However, governments across the world have identified the need to ensure that potentially hazardous radioactive sources are secured to ensure they cannot be misused by those with malicious intent.

In 2002 the Council of Australian Governments (COAG) agreed to a national review of the regulation, reporting and security aspects of hazardous materials.

In April 2007 COAG agreed to several recommendations regarding controlling radioactive material, one of which related to implementing the *Code of practice – Security of radioactive sources (2007)* published by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). The code categorises sealed radioactive sources into five categories and allocates security requirements commensurate with the risk posed by sources in each category.

The most stringent requirements apply to what are best described as ‘high consequence sealed sources’.

These sources are often used for purposes such as:

- blood irradiation
- industrial irradiation
- high-dose-rate brachytherapy to treat cancers
- research irradiation
- industrial radiography
- well logging
- fixed gauges used in industry to measure thickness or control flow of materials
- moisture and density gauges.

This code requires, among other things, that source security plans and transport security plans be developed, and that physical security measures be implemented. The code requires a graded response depending on national security threat levels and the category of the sources being possessed or transported.

The code also requires that background security checks be carried out for people dealing with security-enhanced sources. These checks will include background checks for politically motivated violence.

In accordance with an agreement reached among Australian jurisdictions, the code became mandatory in Victoria from January 2010 for what the code describes as Category 1, 2 and 3 sealed sources.

Parts of the code that are not yet mandatory are the requirements for:

- certain people to undergo identity or background security checks (these checks are not mandatory because processes or standards for these checks have not yet been agreed on)
- security plans to be approved by authorised assessors.
During the 2011–12 financial year the department has continued to be an active participant in several national committees and working groups on issues relating to implementing the code. These activities focused on developing agreed standards for background security checks and accreditation standards for security assessors. The department has also been an active participant in developing a protocol for all Australian jurisdictions that will ensure the movement of high-consequence sealed sources around Australia is better regulated.

A national agreement among the various state and territory jurisdictions was reached regarding implementing a system of accrediting source security plan and source security transport plan assessors. This system will involve ARPANSA certifying that applicants have met mandatory competency standards, and is likely to require complementary legislation in each jurisdiction, including Victoria, to provide a mechanism for authorising such people to undertake the activity.

No agreement has yet been reached on the manner in which security background checks are to be carried out for those dealing with or transporting security-enhanced sources.

It is likely that there will be more developments in this area in 2012–13.
Disposal of radioactive material

The department has been implementing a series of actions during 2011–12 to improve the way it regulates the disposal of radioactive material.

These actions follow an internal review completed during 2010–11.

The review found that changes were required to address risks associated with disposing of sealed radioactive sources. More particularly, this centred on the process of disposing of sealed sources by exporting to approved international facilities for reprocessing or recycling so that they can be used again by another party.

These types of sources typically have longer half-lives such as caesium-137, which is commonly used in industrial gauges that measure product and material characteristics, and has a half-life of 30.2 years.

In particular, the changes involved:

- modifying an existing exemption from the requirement to hold a management licence to ensure that the register of radiation sources, particularly radioactive material, is comprehensive (this has been completed and is discussed in more detail later in this report)
- creating a new general licence condition relating to acquiring and disposing of radiation sources and, in particular, new requirements described in a new document called Disposal of radioactive material – management licence holder’s obligations (this task has been completed but variations are required to all radiation management licences to give effect to this change)
- requiring people or companies that offer disposal-related services for sealed radioactive sources to hold a management licence specifically authorising those activities and introducing new detailed requirements for those licences to reduce the potential for ‘disposal facilitators’ to accumulate radioactive material for significant periods of time (this change has been made but variations are required to all radiation management licences to fully give effect to this change; the department has now licensed a small number of Victorian-based companies to dispose of sealed sources and of sealed source apparatus by exporting the sources to facilities located in other countries)
- applying these new conditions and requirements to existing management licences through variations to management licences (this is approximately 75 per cent completed and is hoped to be completed by March 2013).
Education sessions

The department carried out 14 radiation safety education sessions during the year. These involved:

- two lectures to personnel from the Country Fire Authority and other emergency response organisations on responding to radiation emergencies
- eight lectures to Metropolitan Fire Brigade personnel on responding to radiation emergencies
- four presentations on radiation safety, the Radiation Act and Radiation Regulations to dental hygienists at La Trobe University Bendigo campus and the Melbourne Dental School (The University of Melbourne).

Emergency response service

Under Victoria’s emergency management arrangements, the department is the control agency for radiological emergencies. As part of that responsibility, the department maintains a 24-hour, seven-day-a-week response service involving specialist radiation safety staff. The staff members have access to vehicles containing specialist radiation safety detection and ancillary equipment.

Review of Victoria’s preparedness to respond to incidents involving radiation

As reported in the 2010–11 annual report, the department initiated a major review of the state’s preparedness to respond to incidents involving radioactive material.

This review was completed in September 2011.

The review found that although the likelihood of significant radioactive material incidents is very low, the consequences could be high.

One of the most significant findings was that with a low-probability/high-consequence hazard such as incidents involving radioactive material, the greatest gains in preparedness come from a comprehensive ‘all hazards/all agencies’ approach to emergency management rather than through a specific response to radioactive material incidents.

The department continues to work with emergency service organisations on implementing the review’s recommendations.
Authorised officer training

In the 2011–12 period, the first group of staff appointed as ‘authorised officers’ under the Radiation Act completed the Certificate IV in Government (Investigations).

This two-week course is designed to build on the current skills and experience of those with statutory responsibility. It includes administrative, criminal and regulatory investigations, acting on noncompliance, compliance monitoring, investigating suspected breaches of legislation and reporting on outcomes and recommending actions. The remainder of the authorised officers in the department’s radiation team are expected to undertake the training in 2012–13.

The department intends to continue identifying training needs regarding compliance activities. This is part of a broader plan to ensure compliance and enforcement activities are efficient and address priority areas.

Ongoing participation on the National Radiation Health Committee

The department continued to be represented on the National Radiation Health Committee (RHC). The role of the Radiation Health Committee is to advise the Chief Executive Officer of ARPANSA and the National Radiation Health & Safety Advisory Council on matters relating to radiation protection, including formulating draft national policies, codes and standards for consideration by the Commonwealth, States and Territories.

ARPANSA publishes a summary of the meetings of the RHC at <http://www.arpansa.gov.au/aboutus/committees/rhc>
The Victorian Public Health and Wellbeing Plan

The Victorian Public Health and Wellbeing Plan 2011–2015 is a prevention strategy that forms part of the framework for Victoria’s health system. In relation to radiation safety, the plan, which was released in September 2011, identifies:

… the rapid growth in the collective radiation dose to the population arising both from the increasing use of ionising radiation diagnostic medical imaging procedures and from higher dose X-ray technology, particularly computed tomography (CT) scanning.

It also identified that there is an opportunity to:

… further develop radiation safety efforts to continue to protect Victorians from the harmful effects of radiation, while continuing to enjoy the benefits that radiation brings to many areas ranging from medical to industrial uses. This could encompass regulation, risk communication, emergency preparedness, the long-term management of radioactive waste and the protection of high-consequence radioactive material from misuse by terrorists.

As discussed elsewhere in this report, the department has taken actions in both of these areas during 2011–12.

Review of all management licences

The department conducted a review of the licensing conditions that have been applied to the more than 2,450 management licences since the Act commenced in September 2007. The Victorian radiation safety system is predominantly a licensing system. This is essentially the same in other Australian jurisdictions.

In Victoria’s case, the licence describes the nature of the radiation practice that the management licence holder is authorised to conduct at one or more sites in Victoria.

The majority of the terms and conditions used in management licences reflected the style used under the former legislation prior to the Radiation Act becoming law. While there have been numerous changes to the licensing of specific radiation practices there has not been a significant review of the system since the Act began.

The department considered that a review would provide opportunities to streamline the licensing system.

The outcomes of the review include the following:

- Two new conditions will be applied to all management licences. These new conditions relate to the mandatory reporting of radiation incidents and the acquisition and disposal of radiation sources. These conditions will replace several existing conditions that are currently applied to many licences.
- The terms used to authorise radiation practices in licences have been edited for consistency.
- Many licence conditions have been removed where there are applicable national codes of practice.
- Many licence conditions referring to national codes of practice have been edited to clarify the elements that are the responsibility of the management licence holder.

New licence applications received after September 2011 have been issued with these new terms and conditions. However, the process for varying more than 2,450 existing management licences is more complex.

Section 65 of the Act requires that where the department wishes to initiate a variation to an existing management licence that it must give written notice to the licence holder stating how the licence holder may seek a review of the decision to vary the licence. The variation does not take effect until 14 days after the licence holder has been notified of the variation.

At the time of publication of this report almost 75 per cent have been varied, which leaves 786 licences still to be varied. The department hopes to have completed the changes to management licences by March 2013; however, it is expected that the variation process for the approximately 11,000 use licences will take approximately 18 months to complete.

Changes to the department’s radiation licensing software are also underway to reduce the complexity of management licences, particularly for larger, complex and multi-site radiation practices.
Mandatory reporting of radiation incidents

As discussed earlier in this report, a new incident reporting condition is progressively being applied to management licences. The new condition is as follows:


The document referred to in the condition describes the mandatory requirement for reporting different types of incidents including when and how to report the incident. It is available at <http://docs.health.vic.gov.au/docs/doc/Mandatory-reporting-of-radiation-incidents>.

Incident reporting remains an important part of the department’s approach to radiation safety.

A summary of all of the radiation incidents reported to the department during 2011–12 is included in this report.
Management licence exemptions

New exemptions from the requirement to hold a management licence were made on 2 April 2012 as part of the review of the disposal of radioactive material discussed elsewhere in this report. The exemptions are available at <http://docs.health.vic.gov.au/docs/doc/Exemptions-from-management-licensing-requirements>.

The practical impact of this change was that management licence holders who are authorised to sell radioactive material must now be specifically authorised to possess radioactive material. Previously the exemption permitted these licence holders to possess radioactive material that they were authorised to sell without needing to be specifically authorised to possess that material.

The intention of this change is to ensure that:

- the possession of any form of radioactive material is specifically authorised by the department prior to a person or body corporate taking possession of that material
- the department has an accurate register of the nature of radiation practices being performed in Victoria including the location of radioactive material.

Improvements to the licensing application process

A major update to the radiation licensing application and notification forms was implemented on 30 December 2011.

The forms were redesigned to be easier for applicants and licence holders to complete. The smart forms are designed to be completed and submitted online.

This update also introduced a new online application form for radiation use licences. This was previously a form that was required to be downloaded, printed, completed by hand and submitted to the department by post.

Public use licences register

On 11 January 2012 the department published an online register of use licences.

The register allows a use licence holder to verify the status of their licence, an employer to verify the status of an employee’s use licence or a member of the public to verify that an individual is licensed.

The register is available at <www.health.vic.gov.au/radiation/publicregisters> and its introduction was well received by stakeholders.

New website

The department’s website relating to radiation safety was redeveloped during the financial year and officially went live on 20 January 2012. The new site can be found at <www.health.vic.gov.au/radiation>.

This redevelopment included a complete review of the website structure and content because a significant proportion of the information had either been removed or updated over recent years. New content was created and the site navigation was overhauled. As a result, the website is now more straightforward to navigate, with licence holders and other stakeholders reporting that it is easier to find the information they are looking for.

Improved data reporting and analysis

The department has been developing major improvements to the way in which it manages radiation licensing data. The new ‘in-house’ reporting system was implemented on 8 November 2011.

During the financial year, more than 60 new reports were developed and implemented, catering for a range of purposes including generating letters to applicants and licence holders, monitoring compliance activities, data quality audits, monitoring the performance of key processes and generating statistics.

These reports have been a key tool in identifying and resolving data issues and improving internal processes.

Output from these reports will be a feature of future annual reports.
Summary of authorities issued by the department

Section 12 of the Act creates an offence for a person to conduct a radiation practice unless the person holds a management licence or is exempt under s. 16 of the Act from that requirement.

The most common radiation practice requiring a management licence is possessing a radiation source. Other radiation practices include:

- transporting radioactive material
- selling radiation sources
- procuring or arranging research involving exposing people to radiation
- mining or processing radioactive material.

Section 13 of the Act creates an offence for a person to use a radiation source unless the person holds a use licence or is exempt under s. 16 of the Act from that requirement.

Table 1 lists the numbers of authorities issued, renewed, suspended, cancelled, varied and transferred and surrendered under the Radiation Act during the 2011–12 financial year, compared with 2010–11.

As the report shows, there has been a continued increase in the number of radiation use licences. The actual number of management licences has fallen slightly due in part to the reduction in the number of licences issued to solaria.

Table 1: Authorities under the Radiation Act for July 2011 to June 2012

<table>
<thead>
<tr>
<th></th>
<th>Management licence</th>
<th>Use licence</th>
<th>Tester licence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issued</td>
<td>120</td>
<td>112</td>
<td>1,333</td>
</tr>
<tr>
<td>Renewed</td>
<td>1,923</td>
<td>511</td>
<td>5,510</td>
</tr>
<tr>
<td>Suspended</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cancelled</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Varied</td>
<td>2,173</td>
<td>337</td>
<td>205</td>
</tr>
<tr>
<td>Transferred</td>
<td>48</td>
<td>29</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Surrendered</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 2 lists the total numbers of current authorities under the Radiation Act as of 30 June 2012.

Table 2: Total numbers of authorities issued as of 30 June 2012

<table>
<thead>
<tr>
<th></th>
<th>Management licence</th>
<th>Use licence</th>
<th>Tester licence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number Issued</td>
<td>2,473</td>
<td>2,480</td>
<td>11,119</td>
</tr>
</tbody>
</table>
Radiation incidents

A total of 72 incidents were reported to the department during the 2011–12 financial year; this is compared with 33 reported in the previous year.

Of these 72 incidents:

- 65 occurred in the medical sector, with most involving unplanned exposures to patients.
- One occurred in a dental practice.
- One involved a transport accident.
- One involved the theft of a vehicle containing radioactive material.
- One involved the loss of two radioactive sources.
- Two involved detecting radioactive material at either a landfill or scrap metal site.
- One involved finding radioactive material on a large site.

The incidents reported are summarised in the appendix.

The increase in the number of incidents in the medical sector is not seen as significant other than as a reflection of continued improvements in the rate of incident reporting. The number of such incidents is still regarded as negligible when compared with the overall number of procedures involving the use of radiation across Victoria.

All incidents were investigated by the department, and all medical maladministration incidents were subsequently reported to the Radiation Advisory Committee. The committee considers each incident report and makes recommendations to the department on action that it considers appropriate.

The action taken by the department varied, depending on the specific incident, but generally included the following actions:

- providing specific advice in relation to identifying patients
- recommending the use of ‘time out’ processes to minimise errors
- confirming current practices at the premises concerned
- confirming that practices had been changed since the incident, that is, that lessons had been learnt
- providing technical advice about how to estimate the radiation dose correctly
- writing to management licence holders about lessons learnt from the incidents.

It should be noted that s. 22 of the Radiation Act creates an offence for a management licence holder to knowingly, recklessly or negligently cause another person to receive a radiation dose greater than the dose limits prescribed in the regulations. However, s. 22 does not apply to a radiation dose received during the course, or for the purpose, of any treatment for, or diagnosis of, an illness or injury.
Appendix: Incident summaries

Guide to units of measurement

Regarding the radiation doses mentioned in the following incident summaries, the public exposure limit is an effective dose of 1 millisievert (1 mSv = 1,000 microsievert (μSv)). For occupational exposure, the limit is an effective dose of 20 mSv per year. Radiation doses to local tissue are usually expressed in a dose unit called the gray (Gy, mGy, μGy and so on).

The becquerel (Bq) is the standard unit of radioactivity.

Incident summaries

| Incident 1 | A patient at a hospital was referred to the radiology department for a CT scan of the abdomen, pelvis and hip. Prior to the procedure the medical imaging technologist (MIT) reviewed the request, and believed that a CT scan of the chest was also required as the clinical notes mentioned a right lung lesion. A CT scan of the chest, abdomen and pelvis was then performed. The patient had undergone a CT scan of the chest only a few days prior; however, the MIT was not aware of this. A proper check of the patient’s imaging history would have revealed the previous scan. The patient received an effective dose of 7.1 mSv as a result of the incorrect scan.
| MITs were reminded that they must use the original referral form to identify the patient prior to a CT procedure, and corresponding identification on both forms must be confirmed. The placement of the pink sheet has been modified such that it is now attached behind the referral to ensure original identification information is clearly visible. The possibility of incorporating the information on the pink sheet in the original referral document was investigated; however, this was not pursued as it was felt that that document would become too crowded and difficult to interpret. The department forwarded its recommended CT time-out procedure for the hospital’s consideration. |
| Incident 2 | Two hospital patient referrals were received for a CT scan of the chest, abdomen and pelvis. One person also required a CT scan of the brain. Standard procedure was followed, with referrals reviewed by a radiologist for confirmation of the imaging protocols required.

The standard procedure at the centre where the incident took place is for the required CT protocol to be recorded on a pink sheet to which a patient identification label is attached. The incorrect pink sheet was attached to each request, (the pink sheet for patient A was attached to patient B’s referral). The pink sheet is routinely attached to the front of the referral, and may partially obscure the patient identification on the original referral. When performing the patient scan, the MIT incorrectly identified the patient using the label on the pink sheet, not the original referral as is required by procedure. The additional effective dose received by the patient was estimated to be 2.3 mSv. |
Incident 3

Four patients at a Victorian hospital had been administered doses of fluorine-18 fluorodeoxyglucose (18F-FDG) for positron emission tomography (PET) scans. During the scanning there was an intermittent computer fault in the PET reconstruction system. When the fault became apparent the rest of the day’s PET bookings were cancelled and an attempt was made to image the patients who had already been administered radiopharmaceuticals. Two of the patients were successfully imaged; however, the remaining two could not be imaged, which necessitated repeat scans at a later date for those two patients. The patients received an approximate effective dose of 7.9 mSv and 6.2 mSv as a result of the ineffective scans.

The faulty equipment was repaired and tested prior to clinical use. In addition, a back-up system was available on-site for the next clinical session to ensure that if another failure occurred it would not result in another ineffective scan.

Incident 4

At a hospital, two radiotherapy treatment fields were misaligned during an external beam procedure. The two fields (posterior spine and hip) were incorrectly located during the planning process. The incident resulted in delivering 8 Gy to healthy tissue in the left iliac region and an overlap in treatment fields of approximately 12 Gy at the lumbar spine.

The patient had originally been scheduled to undergo planning imaging on a radiotherapy simulator; however, they had to be unexpectedly transferred to a planning CT scanner instead. During the CT process provisional treatment field borders were set as a representative area for the oncologist to later mark out the exact fields to be used in the treatment. The radiation oncologist overseeing the therapy was not aware that the planning images had been done on the CT scanner and therefore performed the delineation of treatment fields using 2D mode instead of 3D mode. The planning radiation therapist, expecting the oncologist to have used the 3D mode to mark the fields, later entered the treatment planning data into the treatment system using 3D mode. As result of this the treatment plan that was generated using provisional field borders that had previously been drawn up instead of the fields marked out by the oncologist.

The primary cause of the incident was a poor design in the workflow of the treatment planning system. In response to the incident, the centre involved ceased the practice of marking our provisional fields, and reminded radiation therapists to notify oncologists of the planning mode being used for a treatment.
Incident 5
A hospital patient was undergoing a nuclear medicine procedure that involved labelling with a radioisotope the leukocytes in the blood. The nuclear medicine technologist who was conducting the procedure did not follow the protocol necessary to label the leukocytes. A solution of technetium-99m/tin ($^{99m}$Tc-Sn) colloid was prepared in a syringe for the blood labelling procedure. It was then injected into the patient. The correct protocol is for the $^{99m}$Tc-Sn colloid to be mixed with a sample of the patient’s blood and the mixture injected into the patient. As a result of the incorrect procedure, the patient’s leukocytes were not properly labelled. The patient received an effective dose of approximately 8.2 mSv because of the incorrect administration.

The department recommended that a double-checking process be implemented for nuclear medicine procedures. Such a process would involve a second nuclear medicine technologist double-checking the patient identification details, the referral for the procedure, the radiopharmaceutical, and the radiopharmaceutical activity to be administered prior to a procedure. In the absence of an assistant, a technologist conducting a nuclear medicine procedure could double-check these details themselves before administering the radiopharmaceutical. It was also recommended that patients be injected in the nuclear medicine department rather than in a ward. The nuclear medicine department provides a more controlled environment in which to administer radioactive material.

Incident 6
A patient underwent a CT scan of the wrong region because the MIT who was conducting the scan selected the wrong protocol from the CT system. The error appeared to be due to a lack of concentration by the MIT. The patient received an effective dose of approximately 6.8 mSv because of the incorrect scan.

Investigations into the incident indicated that staff at the centre appeared to be aware of patient identification procedures but that these procedures were not well documented. Furthermore there was no CT time-out procedure established.

The department recommended to the centre that it establish a CT time-out procedure and clearly document patient identification procedures.

Incident 7
A hospital patient was undergoing whole-brain radiotherapy treatment consisting of five fractions, with approximately 4 Gy delivered per fraction. A portal image was initially used to define the anatomical margin for the treatment. However, this did not provide adequate coverage of the treatment region. Subsequently, a second megavoltage image was taken with an increase in the field of view to ensure the required region was covered. Prior to beginning the treatment, the field size was selected according to the original megavoltage image, rather than the second image. The error was discovered during routine quality assurance checks after the treatment.

An analysis of the dose delivered determined that approximately 18 per cent of the brain volume had received a dose of 16 Gy instead of the intended 20 Gy; the remaining brain volume received the intended dose. The supervising radiation oncologist was of the view that the under-dosing was not clinically significant.

In response to the incident, protocols have been changed at the centre such that in the future all whole-brain treatments will be planned with a CT.
| Incident 8 | A hospital patient underwent a CT scan of the brain that had been intended for another patient. The patient received an effective dose of approximately 2.7 mSv as a result of the unnecessary procedure.  

The error occurred because the referring medical practitioner placed the wrong patient identification label on the request form. The centre had a time-out procedure in place and this was followed by the MIT who performed the scan. Since the details on the referral matched the patient, and the patient exhibited indications consistent with the need for a CT of the brain, the MIT did not identify that there had been an incorrect referral. |
|---|---|
| Incident 9 | Two hospital patients were scheduled to undergo myocardial scans involving rest and stress protocols. During the post-processing phase of the rest scan (after the images had been acquired), it was noticed that there had been a mismatch between the collimator and the acquisition protocol. This rendered the images that had been acquired of no diagnostic use.  

By the time the problem had been identified, the patients had been administered with the stress dose. As a result, the rest scan could not be re-acquired that day and the patients had to be brought back the following day for a repeat rest scan. The patients received an effective dose of approximately 4.6 mSv as a result of the unsuccessful radiopharmaceutical procedures.  

Following the incident the centre reviewed procedures to ensure that images were processed prior administering the stress dose. Additionally, nuclear medicine technologists were reminded to pay attention to system error messages generated by imaging equipment. |
Incident 10  
An adolescent patient at a hospital who was receiving nuclear medicine therapy as an inpatient left the hospital prior to being authorised for discharge.  
The patient had been referred by an external endocrinologist for thyroid cancer treatment involving the administration of iodine-131 ($^{131}$I). The patient attended the hospital for a consultation on the day of admission, accompanied by her mother. The patient was then admitted and treated with a 3,885 megabecquerel (MBq) dose of $^{131}$I.  
Three days post-administration the patient attended the medical imaging department for imaging and review. It was identified at this time that the residual activity in the patient required was in excess of the discharge limit, meaning the patient had to remain in hospital. The patient and her mother returned to the ward, and then left the hospital against medical advice.  
The family declined to return to the hospital but agreed to follow additional safety precautions (including not attending school) until one month after administration.  
The department’s investigation into the incident revealed that there had been no significant delay between the initial consultation with the patient at the hospital and the administration of the treatment. This meant that the patient and her mother did not have much time to consider the procedure and whether or not they would be able to comply with the radiation safety precautions involved post-administration. Furthermore, no evidence was found that the centre conducted an assessment of the ability or willingness of the patient to comply with the radiation safety precautions.  
The department recommended that, for treatments involving minors, consideration be given to involving a paediatric specialist in the consultation prior to the procedure to assess the patient’s ability to comply with radiation safety precautions. It was also recommended that the consultation prior to a therapeutic procedure occur at least a day prior to the administration to allow the patient and/or a guardian to consider whether they could comply with restrictions imposed because of radiation safety.  
Treating centres should undertake a documented assessment of the patient’s ability to comply with radiation safety precautions post-administration. Clear and documented information should be provided to patients to help them make an informed decision. Similarly, there should be guidelines in place to determine what to do in the event that a patient leaves prior to their authorised discharge.
<table>
<thead>
<tr>
<th>Incident 11</th>
<th>An altered biodistribution of fluorine $^{18}$F-FDG was noted after nine patients in a single hospital had been administered with the radiopharmaceutical as part of a PET procedure. The anomalous distributions were noted as increased uptake in the lung, stomach and pancreas, and reduced uptake in the cortical brain. During the synthesis procedure, liquid from reagent vial 4 (used to dilute the final mixture before passing through purification columns) was only partially added to the reaction vial. The operator manually added more water using a manual mode. The final yield of FDG was approximately half of that normally expected. Similar dilution failures have occurred in the past without any impact upon tracer biodistribution. This process was consistent with the standard operating procedure (SOP) for the process. Subsequent investigation revealed higher than normal residual acetonitrile in the final product vial, which may also have contained partially unhydrolysed FDG (AFDG). The AFDG should have been identified by the quality control procedures undertaken on the batch. Following the incident the PET centre reviewed scientific literature and discussed the incident with other centres but was unable to confirm the cause of the altered biodistribution. The department authorised the synthesis module to be returned to service provided that the centre was confident that no-one would be put at risk. The introduction of additional quality control checks to identify anomalies in temperature and pressure continues to be closely monitored, with the module to be removed from service immediately in the event of any further failure. Additional quality control checks will identify any future episodes of such a failure and result in immediate rejection of the batch. No patients reported any adverse affects from the administrations, and eight of the patients underwent a subsequent PET scan within the next few days. None of the repeat scans showed the altered biodistribution seen of the first administration.</th>
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<tr>
<td>Incident 12</td>
<td>A patient at a hospital underwent a CT scan of the brain that had been intended for another patient. The patient received an effective dose of 2.0 mSv as a result of the procedure. The error occurred because the referring clinician attached an incorrect patient identification label to the request form.</td>
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<td>Incident 13</td>
<td>A patient at a hospital was administered the wrong radiopharmaceutical during a nuclear medicine procedure because the technologist selected the wrong vial while preparing the dose. The patient received an effective dose of 5 mSv as a result of the administration. In response to the incident, the hospital reviewed the process for labelling radiopharmaceutical storage containers, and vials were separated from each other as far as possible in the storage fridge. The hospital also implemented a procedure requiring technologists to initial and date vials to indicate they had been checked.</td>
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</table>
A staff member at a medical imaging practice booked a patient for a CT of the cervical spine. The intention of the patient’s referral was a request for a CT scan of the lumbosacral spine. However, the request was stated as a ‘CT S Spine’, which is an unusual abbreviation for such a procedure. In addition, the requested procedure and the clinical details were partially obscured by the printed text on the referral. On presentation to the practice, the patient’s appointment was processed without a check that the procedure on the referral matched the procedure that the patient had been booked in for.

The MIT who conducted the procedure (MIT1) was still in training and was required to work under the supervision of a senior MIT (MIT2). MIT1 called the patient in and performed an identity check but did not ask the patient about the intended procedure. MIT1 noted that ‘pins and needles’ is often a problem associated with the cervical spine and interpreted the request as ‘CT C Spine’ instead of ‘CT S Spine’. MIT2 checked the positioning of the patient but did not check the referral to ensure that the correct procedure was being performed. MIT2 relied on the booking information and MIT1’s interpretation of the referral. MIT2 then sat with MIT1 while they performed the CT cervical spine scan. The patient received an effective dose of 2.2 mSv as a result of the incorrect scan.

The radiologist who reported the procedure saw only a scanned copy of the referral, which was of degraded quality. Pathology observed on the images, including disc bulges, was consistent with the clinical notes of ‘pins and needles’ and so there was nothing to alert the MIT to the possibility that an incorrect test had been performed.

The referring doctor rang the next day to inform the staff at the practice that the incorrect procedure had been performed. He issued a new referral clearly stating that a CT of the lumbosacral spine was required. The patient returned and the correct procedure was performed.

It is considered that the incident was the result of human error.

The staff members at the practice through whom the referral passed did not adequately check that the booking information matched what was written on the referral or query the unusual notation for the procedure. In this case it is possible that a misunderstanding on the phone and illegible or unusual terminology on the referral may have led to the incorrect procedure being booked. The fact that the referral was difficult to read due to the requested procedure and the clinical details being partially obscured by the printed text is likely to have been a contributory factor. However, had staff members read the referral, then any queries regarding the notation should have been made to the referring doctor, rather than assumptions based on clinical notes.

It was stressed to the practice that it is vital that staff check that referral details correspond to the procedure that is being booked. It is the responsibility of the senior MITs to ensure trainees perform the correct procedure on the correct patient.
<table>
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<tr>
<th>Incident</th>
<th>Description</th>
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<tr>
<td>Incident 15</td>
<td>A patient at a hospital underwent a CT scan that was later repeated unnecessarily. The patient received an effective dose of approximately 22 mSv as a result of the repeat scan. The error occurred because a booking had been made for the scan scheduled to take place on a Monday; however, over the weekend it was necessary to reschedule the scan to an earlier time. A second request form was created for the rescheduled scan. The MIT who conducted the scan cancelled the later booking. Subsequently a new booking was created based on the original referral, which led to a repeat scan. In response to the incident, the hospital revised procedures in the event of a booked procedure going ahead earlier than scheduled. The revised procedures require the original booking to be cancelled and for a coloured label to be attached to duplicate request forms with instructions to the medical imaging department.</td>
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<tr>
<td>Incident 16</td>
<td>A patient at a hospital was undergoing intensity modulated radiation therapy (IMRT) to treat prostate cancer. During the planning phase, digitally reconstructed radiographs (DDRs) from a previous version of the treatment plan were attached to the kV setup fields by mistake. The kV setup fields were incorrect and used for beam matching on four occasions, resulting in a beam misplacement error of 2.8 cm for three fractions and 2.5 cm for one fraction. The incident was detected part way through the treatment course, at fraction 22. Eighteen out of 22 treatments were delivered to the correct location. The treatment plan was adjusted to ensure that the patient received the full dose as planned.</td>
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<tr>
<td>Incident 17</td>
<td>A hospital inpatient inadvertently underwent a CT examination of the chest, abdomen and pelvis, which had already been performed. The patient received an effective dose of approximately 28 mSv as a result of the repeat scan. The repeat CT examination was performed because a second referral slip was completed and delivered to the radiology department prior to the first referral slip. The second referral slip was acted upon and the CT scan performed. The first CT request then went through the normal booking system and was performed three days later. The hospital's ‘time out’ identification process would not, and did not, pick up this error because the correct patient received the correct procedure as per the referral slip. As a result of this incident, the hospital introduced a step in the MIT’s procedures to determine whether the examination has already performed and, if so, to consult a radiologist to determine whether the second procedure needs to be done.</td>
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<tr>
<td>Incident 18</td>
<td>An adolescent patient at a hospital underwent an unnecessary repeat CT scan of the brain. The MIT performed a CT scan using the centre’s standard brain scan protocol after discussing the case with a radiology fellow. The radiology fellow called the CT room shortly after and requested 3D images of the patient. The MIT interpreted this to mean that another scan was required using the 3D brain scan protocol and so re-scanned the patient with this protocol. The radiology fellow had in fact intended for the original scan data to be reprocessed to provide 3D images. Reprocessing of the original data would not have required an additional scan. As a result of the unnecessary repeat scan the patient received an effective dose of approximately 1.9 mSv. The incident was caused by a miscommunication between the radiology fellow and MIT.</td>
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<tr>
<td>Incident 19</td>
<td>An inpatient at a medical imaging practice was booked in for an ultrasound scan and a nuclear medicine bone scan procedure. The patient was sent to the medical imaging department and was administered with a radiopharmaceutical for a bone scan. Subsequent to the administration, the medical imaging department was contacted and advised that the patient did not require a bone scan. As the imaging had not yet been performed the procedure was cancelled at this point. The patient received an effective dose of approximately 4.7 mSv as a result of the administration of the radiopharmaceutical. The error occurred because the referring clinician attached an incorrect patient identification label to the request form.</td>
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<tr>
<td>Incident 20</td>
<td>A hospital patient underwent an unnecessary three-phase CT scan of the liver. The request for the procedure was faxed to the radiology department and the scan was conducted in accordance with the request. The original copy of the referral arrived at the department a few days later, and as a result the patient unnecessarily underwent the procedure again. As a result of the unnecessary scan the patient received an effective dose of approximately 23 mSv. Both the administrative staff and MIT involved were reminded of the importance of checking requests prior to imaging.</td>
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<tr>
<td>Incident 21</td>
<td>A paediatric patient at a hospital underwent an unnecessary radiograph of the elbow. The error occurred due to the referring clinician indicating the wrong radiographic view on the request form. As a result of the unnecessary radiography, the patient received an effective dose of approximately 0.01 mSv. In response to the incident, the referring clinician was reminded of the importance of taking care in writing referrals.</td>
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<tr>
<td>Incident 22</td>
<td>A hospital patient was scheduled to undergo a nuclear medicine procedure. The patient’s medical records, which were at a different campus of the hospital, were requested by the nuclear medicine department. The scheduled procedure was carried out but, when the records arrived, it became apparent from the referral that the nuclear medicine department was in possession of a photocopy of a previous request for the same procedure, which had already been performed at the other campus. The patient received an effective dose of approximately 5.7 mSv as a result of the unnecessary procedure. The technologist had not checked the patient’s history to see whether a scan had recently been performed.</td>
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<tr>
<td>Incident 23</td>
<td>A radiotherapy planning error occurred at a hospital, resulting in radiotherapy being provided to a patient at a higher rate (lower number of fractions) although within the overall dose regime. The incident occurred because the treatment prescription was miswritten as 64 Gy in 23 fractions, instead of 32 fractions (dose per fraction was 2.78 Gy instead of 2 Gy). The error was identified after 21 fractions at a standard review and treatment was suspended and amended to address side effects.</td>
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<tr>
<td>Incident 24</td>
<td>After receiving a patient referral for a CT scan, the receptionist at a hospital searched for the patient in the booking system. The system did not register that the patient underwent the scan the day before and the patient was subsequently scanned for a second time. The patient received an effective dose of 1.4 mSv as a result of the unnecessary scan. The case was subsequently reviewed at a hospital radiation safety meeting. No further information is available.</td>
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<tr>
<td>Incident 25</td>
<td>A CT scan was repeated at a hospital because fine slice information was deleted. The patient received an effective dose of approximately 8.4 mSv as a result of the first scan. The department has requested further information but this is not yet available.</td>
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<td>Incident 26</td>
<td>A patient at a hospital was ordered a sestamibi bone scan but was administered hydroxymethane diphosphonate (HDP). The request slip was considered to be clear and the misadministration was found to be a result of human error. The patient received an effective dose of approximately 4.9 mSv as a result of the misadministration. The chief nuclear medicine technologist subsequently met with staff to discuss potential improvements to administration practices.</td>
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<tr>
<td>Incident 27</td>
<td>A patient received a CT brain scan at a medical imaging practice. The referral slip was from the treating hospital. Diagnostic information obtained from the scan revealed that a magnetic resonance imaging (MRI) scan was required. The patient was booked in for an MRI for the following day. In addition to the request for the MRI, the referral for the initial CT brain scan was faxed to the medical imaging practice. The staff member who received the booking was unaware that the patient had already had the CT brain scan and booked the patient in for an additional CT brain scan. The patient received an effective dose of approximately 2.9 mSv as a result of the extra CT scan. The medical imaging practice implemented a process whereby ward staff would indicate when a referral has been faxed by writing “faxed” on it. The intention of this procedure is that it allows for the faxed copy to be matched to the original prior to the procedure being performed, and in doing so preventing the faxed copy from being used in lieu of an original.</td>
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<tr>
<td>Incident 28</td>
<td>A hospital patient had two unnecessary CT scans. The patient had two CT abdomen (non-contrast and arterial phase) scans, when no such scans were protocolled. The MIT set up the patient on the table. When leaving the room, the MIT forgot and left the referral and protocol form on equipment inside the scan room. Seeing a protocol form on the control desk on his return to the room, he assumed he had already moved the form from the scan room. He used the incorrect form to select the scan type, and proceeded to conduct a pancreas study instead of a chest/abdo/pelvis study. When the three phases of the pancreas study were complete, the MIT recalled that this patient was meant to have a chest/abdo/pelvis. He immediately discussed the issue with the duty radiologist. The radiologist advised that the abdo/pelvis component of the pancreas study (portal venous phase) would be adequate to meet the request, along with a chest CT scan. The MIT informed the patient of the mistake and a chest CT scan was performed. The patient therefore received two series (CT abdomen) that were not requested. The patient received an effective dose of approximately 8 mSv as a result of the extra CT scans. The MIT informed the radiation safety officer for the hospital and the supervising MIT. The supervising MIT sent a reminder to all CT staff to request that patient protocol forms be double-checked to ensure they reflect request forms and a reminder to take extra care and time to make the checks. The MIT responsible was counselled regarding the incident.</td>
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Incident 29
A hospital patient presented from a ward for urgent chest and abdomen X-rays. Prior to the radiographic examination being performed, the MIT checked the patient's details including pregnancy status. The patient advised that she had had a pregnancy test in the ward and laughed. The MIT took this to indicate that she was not pregnant. Chest X-rays were performed first to allow any possible bowel fluid levels to be established. As the patient was in severe pain, the chest X-ray needed to be repeated so that a fuller inspiration projection could be obtained to meet diagnostic criteria. A lateral chest X-ray, posterior-anterior (PA) erect abdomen and supine abdomen projections were then performed without incident, but with the patient still in considerable pain. The erect abdomen showed an intrauterine device (IUD) in situ. The patient returned to the ward with a nurse. An hour later the MIT was in the emergency department (ED) when the after-hours nursing coordinator advised the ED chief medical officer (CMO) and the MIT that the patient had returned a positive pregnancy test.

The CMO had been advised by the patient that she had had an IUD in place for five years and had had no periods for the same length of time. The CMO had been unable to obtain a urine specimen to establish pregnancy status. The pregnancy was ectopic and the patient was transferred to another hospital for emergency surgery to remove the ectopic pregnancy.

The hospital changed the wording on the request form so that the referrer had to tick a mandatory field/box indicating that patient was either ‘confirmed pregnant’, ‘not pregnant’ or ‘pending’.

Incident 30
A neurosurgeon at a hospital requested a CT brain scan and could not be contacted to clarify whether fiducial markers should be included in the scan. The radiologist decided not to include fiducials and perform a CT brain scan according to the hospital’s protocol. The neurosurgeon requested that the scan be repeated with fiducials. Therefore, the first scan was unnecessary. The patient received an effective dose of approximately 6.4 mSv as a result of the extra CT scan.

As a result of the incident, the director of radiology discussed the use of fiducials in CT scans with the neurosurgeons at the hospital.

Incident 31
A hospital patient had a CT abdomen angiogram and brain scan in an ED. The patient needed post-scan assistance from the MIT who took the patient back to their ED cubicle. The MIT tended to the patients waiting outside the scan room before reformatting the brain images and sending them to the picture archiving and communication system (PACS), and ultimately forgot to send the images. The images of the brain scan were not sent to PACS, despite the MIT completing the patient’s details on the radiology information system (RIS). The ordering clinician did not locate the scan details for the patient on the RIS and so ordered another CT brain scan two days later for the patient now presenting as an inpatient. The patient received an effective dose of approximately 1.1 mSv as a result of the extra CT scan.

The hospital stressed to its MITs the need to ensure protocols are implemented, in particular that MITs post all clinical results on PACS before closing a study.
<table>
<thead>
<tr>
<th>Incident 32</th>
<th>A wrong patient label was put on a CT brain request slip (next to a handwritten name) and faxed to the medical imaging department at a hospital. As a result, the wrong patient was transferred to the department. As his condition met the clinical details described on the request slip, the medical imaging staff proceeded with the CT brain. After the patient was returned to the unit, the error was discovered. The patient received an effective dose of approximately 2.1 mSv as a result of the unnecessary CT scan. The staff involved were made aware of the error and appropriate education was provided.</th>
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<tr>
<td>Incident 33</td>
<td>A CT scanner at a hospital failed on two occasions to scan at the required phase time during a pulmonary angiogram. The examinations had to be repeated using a second dose of intravenous (IV) contrast media. No error was recorded in the system’s fault log. On the first occasion, the scan had commenced but had terminated part way through. The patient received an effective dose of approximately 1.4 mSv. On the second occasion scanning did not commence so no unnecessary radiation dose was actually received. The hospital had the scanner rotary parts checked when the scanner was serviced shortly after the incident and the problem was resolved.</td>
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<tr>
<td>Incident 34</td>
<td>A female patient presented to a medical imaging practice with a referral requesting a CT renal scan series. The patient informed the MIT that she had recently had a pregnancy test that indicated she was not pregnant. The MIT then performed the CT renal scan series. The patient later informed the clinic that she had since taken another pregnancy test and the result was positive, indicating that she may have been pregnant at the time of the procedure. The information provided by the practice indicates that the gestational age of the embryo would have been approximately one to two weeks at the time of the procedure. The effective dose to the embryo was approximately 37 mSv.</td>
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<td>Incident 35</td>
<td>A hospital patient was administered technetium (99mTc) exametazime (trade name Ceretec) by a nurse. She was subsequently made aware by the nuclear medicine technologist that the Ceretec injected was the dose for the previous day. She was unaware that nuclear medicine staff did not pick up expired Ceretec after 4.30 pm and hence when she saw Ceretec in the cupboard, she erroneously presumed it was the current dose. Nuclear medicine staff informed ward staff that no single-photon emission computed tomography (SPECT) scan could be performed as the amount of Ceretec injected was too low. The patient received an effective dose of approximately 1.04 mSv as a result of the erroneous administration. The hospital implemented a protocol that requires Ceretec syringes to be returned to the nuclear medicine department upon expiry.</td>
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### Incident 36

During exercise for a stress myocardial perfusion scan, a hospital patient was administered with 230 MBq of $^{99m}$Tc sestamibi via an IV line with 10 mL normal saline flush without resistance or obvious subcutaneous swelling. After exercise, subcutaneous swelling was noticed. Scanning determined that the activity had been delivered subcutaneously.

The patient was informed, a new IV line inserted and the exercise test was repeated with 205 MBq $^{99m}$Tc sestamibi readministered intravenously. The patient received an effective dose of approximately 1.6 mSv from the second administration of 205 MBq $^{99m}$Tc sestamibi.

No corrective actions were necessary as the correct procedure for testing the patency of the IV line prior to the scan was performed.

### Incident 37

A patient presented to a hospital ED 10 days after a motor vehicle accident. Plain X-ray imaging of the thoracolumbar spine was ordered. The patient advised both ED staff and the MIT upon questioning that she was not pregnant.

A fetus was observed on the lumbar spine X-ray and further imaging was subsequently discontinued. The patient subsequently underwent MRI rather than X-ray imaging.

The patient seemed unaware of the pregnancy and had been asked routinely regarding possible pregnancy prior to the examination; she had denied any possibility of being pregnant. An obstetric ultrasound scan was performed and confirmed gestational age of 24 weeks, five days. The effective dose to the fetus was less than 1.5 mSv.

### Incident 38

A patient presented to a medical imaging practice with a referral requesting a CT scan of the sacral/coccygeal spine. The MIT read the request form stating that a scan of the sacral/coccygeal spine was required. However, the worklist contained a lumbar spine CT scan. The MIT did not check that the procedure on the referral was the same as the procedure listed in the worklist and proceeded to perform a CT scan of the lumbar spine instead of the requested procedure.

The incorrect procedure was identified by the radiologist during the reporting stage, at which point the patient was informed and the correct scan was performed. The CT scan of the lumbar spine was performed using a series of helical scan protocols. The effective dose due to the CT scan of the sacral/coccygeal spine was approximately 32 mSv.

The CT MIT was reminded by the practice to cross-check the procedure listed in the worklist with the procedure requested on the referral.
Incident 39
A request for a CT brain and a separate request for a CT chest scan were booked and performed for a patient at a hospital. The CT brain request was for a different patient. The CT chest scan was correctly performed.

The error was realised when the MIT checked the request for the CT brain scan and saw that it was for another patient. During questioning of the first patient as part of the hospital’s ‘time out’ procedure prior to the CT examination, the patient had identified that they were having a brain and chest scan, as they had been sent a booking letter for both of these scans.

The initial error was made in the radiology booking office. Patient data/request from ‘inpatient encounter’ had to be re-ordered as an ‘outpatient encounter’ on the RIS and the request was subsequently ordered for two different patients (one correct, one incorrect).

The MITs involved correctly performed positive patient identification (PPID) and discussed the imaging with the patient prior to the scan. The MITs were satisfied that the PPID and procedure information obtained via the patient were correct and proceeded with the examinations. However, neither MIT checked the CT brain request. Both referred mainly to the CT chest request when assessing the patient. If the CT brain request had been assessed for correct patient details the error may have been avoided. The patient assumed that their doctor had ordered both scans. The effective dose due to the unnecessary CT brain scan was approximately 2.3 mSv.

The hospital reminded its staff members about the ‘time out’ and positive PPID policies, and to check requests properly. Subsequent changes to the RIS mean that patient requests for encounters changing from inpatient to outpatient no longer require these particular steps, reducing the potential for this error to occur.

Incident 40
An MIT at a medical imaging practice identified a patient for a cervical spine study. Despite following an identification protocol, the MIT failed to notice that the box marked ‘CT’ had been checked and performed a cervical spine plain radiograph series.

The error was subsequently identified by the patient’s referring doctor. The effective dose from the plain radiograph series was 0.2–0.3 mSv.

The practice reinforced the importance of correct patient and procedure identification to all staff.

Incident 41
A person presented to a hospital ED complaining of abdominal pain. The patient was aware that she was five weeks pregnant. The ED doctor indicated the pregnancy on the electronic referral form. The doctor selected X-ray instead of ultrasound for examination type requested on the form. The doctor subsequently electronically corrected the referral to change the examination requested to ultrasound and printed it at a printer close by not realising the imaging department had already received the X-ray request electronically. The doctor then went to the imaging department to clarify sonographer arrangements for the afternoon. He was queried as to whether the referral held by the MIT was needed and confirmed that it was. The X-ray was subsequently conducted and the error later identified. The effective dose to the fetus was approximately 1.6 mSv as a result of the X-ray.

The hospital’s case review processes were followed to investigate the causal factors and implement preventive measures. Various measures were implemented to address the electronic and behavioural factors contributing to the incident.
| Incident 42 | An appointment was given to an hospital ED patient for a pelvic ultrasound scan. The referring ED clinician subsequently requested an abdominal X-ray to be performed on the patient as well. The patient was sent to the X-ray department and an abdominal X-ray was performed. The patient indicated to the radiographer that she was not pregnant. The radiographer double-checked the pregnancy status with the patient. The patient then had a pelvic ultrasound performed. On the ultrasound scan the patient was found to have an ectopic pregnancy. The referring ED clinician had not waited for the results of the pregnancy test before requesting the abdominal X-ray. The patient was subsequently transferred to another hospital to remove the ectopic pregnancy. The effective dose to the fetus was less than 1 mSv. The wording on the request form has been changed so that the referrer has to tick a mandatory field/box stating either ‘confirmed pregnant’, ‘not pregnant’ or ‘pending’. |
| Incident 43 | At a hospital, a request for a lower limb X-ray was misread as a lumbar spine by an intern MIT who then performed the lumbar X-ray instead of the lower limb one. A qualified MIT failed to notice the error until the imaging had been completed. The patient was subsequently recalled for the correct X-ray. The effective dose from the lumbar X-ray was approximately 1 mSv. The chief MIT addressed the MITs involved about checking requests. Reminders were sent to all radiographers about checking requests prior to imaging. |
| Incident 44 | A radiation therapy treatment positioning error occurred while treating a patient’s right femur at a hospital. The error arose from an incorrect isocentre placement (15 cm distal to the planned isocentre) resulting in 1.8 Gy being delivered to normal tissue below the prescribed area (approximately 10 x 15 cm). The isocentre was misidentified due to the ambiguous labelling on the Vac-Fix stabilising device. The omission was not detected by routine couch override alerts because the Vac-Fix stabilising device had not been correctly placed on the treatment couch. The radiation oncologist was not concerned that the error would adversely affect the treatment of the patient. The hospital initiated an investigation of the causes of the incident. |
| Incident 45 | The wrong patient underwent an antero-posterior (AP) and lateral lumbar and thoracic spine, and AP and lateral upper and lower femur CT scan at a medical imaging practice. The effective dose as a result of scanning the wrong patient was approximately 3.5 mSv. The practice reinforced the importance of correct patient and procedure identification to all staff. |
| Incident 46 | A patient presented to a medical imaging practice with a referral requesting a parathyroid scan using sestamibi. The patient had been booked in for a sestamibi scan. As sestamibi is often used for cardiac scans, the receptionist incorrectly booked the patient for a cardiac sestamibi scan and placed the patient on the cardiac patient list.

The cardiologist did not check the referral and performed the usual preparation required prior to a cardiac scan, including providing the patient with a description of the procedure. At no stage did the patient query the procedure. The patient was then administered with 165.5 MBq of thallous chloride, which can be used in the place of sestamibi for a cardiac scan. It was not until the patient was set up for the SPECT scan that the error was realised. The referring doctor was consulted as to whether the scan should go ahead. The referring doctor requested that the procedure be completed. The MIT proceeded to perform the scans required for the cardiac test, including two CT attenuation scans. The patient was informed that the incorrect procedure had been performed and was rebooked for the correct procedure. The effective dose as a result of the incorrect administration was approximately 37 mSv.

The practice immediately implemented a policy whereby, once a patient has been processed at reception, the patient’s paperwork is provided to the MIT. The MIT will then check that the requested procedure matches the booked procedure. The MIT will then provide the paperwork to the cardiologist who will perform the stress test. This way, both the MIT and the cardiologist have an opportunity to inspect the referral prior to beginning a procedure, to ensure the procedure performed matches the procedure requested. |
| Incident 47 | A patient accidentally underwent a repeat CT scan of the brain in a hospital ED, which had been performed three hours earlier on the same CT equipment. The patient was informed of this incident. The CT scan was repeated because a second referral card was completed and delivered by the neurosurgical resident to the ED CT. This followed an initial CT scan of the brain being requested by the ED clinician and performed earlier that morning. The neurosurgical resident was unaware that a CT scan had already been performed. Further, neither the radiology registrar, consultant on-duty nor the radiographer who performed the second scan had checked the RIS to determine when the last scan had been carried out on this patient. The effective dose due to the repeat CT scan was approximately 2.4 mSv.

Changes to the hospital’s ‘time out’ procedure that were made before this incident should have picked up this error as the hospital now requires radiography staff to review previous CT imaging to determine if the current scan is necessary. However, in this instance there appears to have been some confusion as to whether this process also includes ED patients in addition to inpatients. The hospital has since clarified with all relevant parties that ED patients are to be included in the above ‘time out’ procedure. |
### Incident 48
A patient (patient 1) from a hospital ED was referred for a CT abdo/pelvis scan as a result of being given another patient’s (patient 2) identification sticker. The MITs followed identification procedures for patient 1 correctly (matching name, unit record (UR) number, clinical details). Patient 1, however, was also meant to have an abdo/pelvis CT scan, therefore the clinical indications were similar and did not indicate an error.

The ED clinician contacted CT to enquire why patient 2 had not received the examination. At this time the MIT realised the incorrect identification sticker had been used, and notified the referring doctor of the error. The doctor then supplied correct referrals for both patients. The effective dose due to CT procedure was approximately 2.2 mSv.

The referring doctor was notified of the error by the hospital and it was requested that the doctor take greater care when completing referrals to ensure details are correct and clear.

### Incident 49
A hospital patient underwent an unnecessary X-ray series as the result of their patient identification sticker being placed on the request slip for another patient who had suffered trauma.

The patient was transported and identified in radiology according to the patient identification sticker on the request. Imaging proceeded until one MIT realised there were no indications of trauma in the imaging. Imaging stopped and the patient was returned to ED. The MIT discussed the error with the patient immediately. The effective dose due to the procedure was 3.8 mSv.

The MITs involved immediately notified hospital management. Management counselled the MIT who identified the patient on the importance of discussing clinical notes/reason for imaging with the patient. Management also notified the referring clinician.

### Incident 50
A patient presented to a hospital ED with severe generalised abdominal pain. Pregnancy status was recorded as ‘unknown’. Chest and abdominal X-rays were requested by the ED clinician. Routine questions by the MIT included pregnancy status. The patient responded that there was no chance that she was pregnant and so the X-rays went ahead. Subsequent bHCG and ultrasound scans confirmed a 10–12 week ectopic pregnancy.

The hospital’s case review processes were followed to thoroughly investigate the causal factors and implement additional preventive measures. Prevention practices, however, will always be compromised in circumstances where the patient denies any likelihood of being pregnant.

### Incident 51
A patient at a medical imaging practice was recorded in the RIS with the incorrect coding. The patient was examined on that basis by the MIT rather than the using the request information. The effective dose for that procedure was approximately 1 mSv.

The MIT was counselled by staff at the practice regarding this error. Staff members at the practice have been advised that all examination details are to be taken from the request form rather than the supporting documentation.

### Incident 52
A patient underwent an unnecessary repeat CT abdomen and pelvis scan at a hospital. The hospital has an internal approval process for CT scans that involves consultation between the requesting clinician and a radiologist to determine if the scan is required. In the case in question, the requesting clinician advised the MIT that the CT had been approved when this was not the case. The effective dose due to the repeat CT scan was approximately 8.5 mSv.

The requesting clinician was counselled by the hospital in relation to this incident.
Incident 53
A female patient presented to a medical imaging practice with a referral requesting a CT scan of the abdomen and pelvis with contrast. The patient's clinical notes indicated that the patient had a mass rising from the pelvis to the umbilicus with no indication that it may be due to pregnancy. The MIT asked the patient if she was pregnant and the patient responded that she was not. The MIT then performed a CT scan of the abdomen/pelvis with contrast.

The mass was apparent on the scout image but it was not until the helical scan that the CT MIT realised that the mass was a fetus. There was no opportunity for the MIT to abort the scan. The radiologist informed the patient of her pregnancy and organised an obstetric ultrasound. The gestational age of the fetus was estimated to be 17 weeks at the time of the scan.

The effective dose to the fetus was approximately 24 mSv.

Incident 54
A patient presented to a medical imaging practice with a referral requesting a CT scan of the lumbar spine. The patient was incorrectly booked for a CT scan of the cervical spine instead of a CT scan of the lumbar spine. The patient's condition as listed in the clinical notes was consistent with either of these scans.

The MIT performed an identification check but did not ask the patient about which region of the spine required the scan. The reception staff had placed the patient billing slip on top of the referral. It is presumed that when the CT MIT read the required procedure, they checked the patient billing slip, which listed the incorrectly booked procedure, instead of the referral. The patient was positioned on the table for a cervical spine scan and the CT assistant/nurse informed the patient that the CT MIT was going to perform a CT scan of the neck. The patient did not object to this information. The CT MIT then proceeded to perform a CT scan of the cervical spine instead of the requested lumbar spine.

The incorrect procedure was identified by the referring doctor, who informed the clinic of the error. The patient was then informed and rebooked for the correct scan. The total effective dose as a result of the cervical spine scan was approximately 4.2 mSv.

The practice addressed MITs about the importance of adequately checking the referral prior to conducting any examination. They were also reminded to ask the patient about the required procedure. To discourage CT MITs from relying on the billing slip rather than the referral, all billing slips are now required to be placed behind the referral.

Incident 55
A patient at a hospital ED was referred to a medical imaging practice for a CT scan of the abdomen. The CT MIT correctly performed an identification check, asked the about the requested procedure, and verified the information against the referral. The CT MIT then proceeded to perform a CT of the head instead of the requested abdomen.

Following the examination the CT MIT realised the mistake and recalled the patient. The CT MIT then performed the requested procedure and informed the chief MIT of the incident. The effective dose due to the CT scan of the head was approximately 2.5 mSv.

CT MITs at the site were informed of the incident and reminded of the importance of ensuring the correct procedure is performed on the correct patient.
### Incident 56
The wrong patient underwent a CT brain scan at a hospital. The MITs in CT received an electronic order for a CT brain scan to be performed on the (wrong) patient. The patient was called to CT for the scan. The patient was correctly identified using the CT ‘time out’ procedure and the CT scan was then performed.

The MITs in CT then received a telephone call (after performing the CT scan) asking if the patient was in CT and advising them that she did not require the scan. The correct patient, in an adjacent cubicle, was then requested to have a CT brain scan. The patient was correctly identified using the CT ‘time out’ procedure and the CT brain was performed on the correct patient. The effective dose due to the CT scan of the brain was approximately 1.7 mSv.

To prevent a reoccurrence of this incident the hospital reviewed: how data was entered into the electronic system; what safeguards there were to ensure doctors have visibility of previous tests ordered; and what procedures were in place to ensure correct patient data is entered so the correct patient is always selected.

### Incident 57
A booking was received at a hospital and was entered into the relevant system as a CT chest and abdomen (booking code – ‘CTCAP’). However, the request slip only asked for a CT abdomen (booking code ‘CTAP’). The MIT correctly read the computer booking but did not correctly read the request slip. The MIT performed the CT chest and abdomen. The effective dose from the CT chest component of the examination was approximately 4.6 mSv.

Staff members were made aware of the error and appropriate education given.

### Incident 58
A patient presented at a hospital ED with persistent left-side chest pain, nausea and vomiting. A chest X-ray was performed and the patient was subsequently sent to the short stay emergency ward. The treating emergency doctor then placed an electronic order requesting a CT scan of the brain, chest and abdomen.

The clinical notes on the electronic order related mainly to her chest – the patient had left chest pain (different to angina pain) and a previous history of left lower (lung) lobe lobectomy.

The MIT, who correctly identified the patient, correct procedure and correct site, then performed the CT scan of the brain and abdomen.

Later, at handover, the clinicians in the ED questioned why this patient had a CT brain scan when she was admitted with chest pain. The director of medical imaging spoke to the clinician involved and confirmed that the CT brain scan was in fact ordered in error. There was never any intention or requirement to order a CT brain scan on this patient but the clinician clicked on the combined order code CT brain/chest/abdomen by mistake when making the request and did not realise at the time. The effective dose to the patient from the erroneous CT brain was approximately 2.4 mSv.

As a result of the incident, the hospital reviewed the electronic order system and recommended several changes to minimise the chance of such an error occurring in future.
### Incident 59

At a hospital, a patient’s identification was not checked correctly before a CT scan and the incorrect patient had the scan. There were several contributing factors:

- the patient had limited English
- each radiographer involved believed the other had checked the patient’s ID band
- the request information and patient identification system had both patients listed in the same cubicle
- both patients were of the same sex, approximately the same age and both presented to the ED after a fall.

The patient who was incorrectly scanned did require a CT brain scan, which was eventually performed. A CT cervical spine scan was performed unnecessarily on this patient. The effective dose for the CT cervical spine scan was approximately 7.4 mSv.

Staff members involved in this incident have been reminded of the hospital’s patient identification policy.

### Incident 60

A dentist had finished taking a bitewing radiograph on a patient and then entered the surgery to remove the bitewing radiographic film from the patient’s mouth when the agency dental assistant accidentally pressed the X-ray unit exposure button while wiping the exterior of the X-ray unit. The dentist was 16 weeks and five days pregnant at the time. The effective dose to the fetus was less than 0.002 mSv.

The dentist has subsequently requested that the dental assistant switch off the dental X-ray unit prior to wiping the dental unit.

### Incident 61

An unplanned exposure of a pregnant patient occurred in the trauma centre of a hospital. A CT brain and cervical spine scans and plain X-ray imaging of the chest, pelvis, thoracic and lumbar spine and femur were undertaken on the patient.

The patient stated that she was not pregnant when questioned by the radiographers prior to imaging. A beta HCG test was positive and confirmed that the patient was pregnant. The patient was advised of the positive beta HCG and the imaging was discussed with the patient at that time. The effective dose to the fetus was approximately 2 mSv.

The hospital held a meeting between the heads of the emergency medicine, radiology and trauma departments to review the processes undertaken to determine pregnancy status in trauma patients and the use of these results in ordering and performing imaging involving ionising radiation exposure.
Incident 62
A hospital patient presented to diagnostic imaging for a CT brain scan (with contrast). A non-contrast scan was completed successfully. After administration of IV contrast, the post-contrast scan was initiated but the images did not immediately appear. All other parameters were normal (table movement and gantry lights) and every attempt was made to recover the data but these efforts were unsuccessful. Due to the time-critical nature of the post-contrast scan, the patient was then re-scouted and re-scanned in order to acquire the post-contrast images. In this instance the acquisition was successful. No error logs had appeared during the entire acquisition/scan. The local disc was not full.

Radiographers attempted to load the images into the reconstruction database to reconstruct the images from the scan that acquired blanks, but this was unsuccessful. On review of the dose report it appeared that the radiation dose had been given to the patient. No similar faults were experienced throughout the rest of the day. An X-ray engineer was contacted immediately and attended later in the day. An inspection of the error logs did not reveal any obvious cause for the fault. The engineer eventually gave the chief MIT the reassurance that the CT unit was safe to use. No recurrences have been experienced since. The effective dose due to the repeat CT scan was approximately 1.5 mSv.

Incident 63
A request was made at a hospital for a patient to have a CT chest scan and the scan was subsequently booked. The request documentation was collated in order to prepare the imaging protocol but the referring clinician cancelled the requested scan very late on the same day that it was requested. The booking was cancelled from the RIS but the protocol paperwork was not removed from the next day's paperwork bundle.

Referral and protocol paperwork were reviewed and completed by the radiologist overnight. The following day the patient was called and prepared for the scan. Upon commencing the scan, the MIT noticed the scan booking on the RIS had been cancelled. However, because there was a mismatch between the noted protocol and the booked scan (CT chest), the MIT assumed this was an error in the RIS and that the cancellation had been in order to correct the booking. The MIT re-booked the scan on the RIS according to the noted protocol and completed the scan.

The incident was identified because the referring clinician later contacted radiology to ask why the scan had proceeded. The effective dose due to procedure was approximately 12 mSv.

Corrective actions implemented to prevent future incidents of this sort included improved communication between booking staff and MITs, and cancellations by clinicians to be implemented by an MIT from the relevant modality, not by administration staff.
| Incident 64 | An incident occurred at a medical imaging practice involving an incorrect procedure performed on a patient. The patient was referred to the practice for an X-ray of the pelvis. The MIT who conducted the procedure was supervising a student. The MIT noticed that the audible signal duration was for longer than expected and terminated the exposure. The MIT discovered that the student had altered the exposure settings from manual exposure control to automatic exposure control (AEC). As the patient was not being imaged using the bucky, where the AEC chambers were located, the AEC chambers were not irradiated and the exposure would not have terminated until after an exposure of 600 mAs or six seconds, whichever was reached first. The X-ray was severely over-exposed and unusable and a repeat of the X-ray was taken with the intended settings. The exact parameters of the incorrect exposure are unknown, nevertheless the effective dose to the patient was estimated as being 2.7 mGy. Staff members at the practice were reminded that it is the responsibility of the MIT initiating the exposure to ensure that the correct exposure factors have been selected. It was also emphasised that, where a student is involved, it is ultimately the responsibility of the qualified staff member to ensure the correct procedure (including exposure factors) is used. |
| Incident 65 | An inpatient at a medical imaging practice was referred for a CT abdomen with contrast. Instructions were given to the ward to contact radiology when a cannula had been inserted. When advised that the patient was ready he was transported to radiology where the abdominal CT scan was attempted. However, the MIT discovered that the cannula was not inserted properly. The patient was taken to the trolley bay while the referring clinician was paged to reinsert a cannula in the other arm. When the clinician had still not attended after one hour a consultant radiologist consented to a non-contrast scan being done. A non-contrast CT chest scan was carried out by mistake, rather than the requested CT abdomen. This resulted in an unnecessary effective dose of approximately 4.5 mSv. The ‘time out’ process used by the practice was stressed to staff and the MIT involved was disciplined. |
| Incident 66 | An incorrect nuclear medicine procedure was performed on a patient at a hospital. A patient was referred for a bone scan and the appointment booked as a heart (MIBI) scan. The patient was prepared for the MIBI scan and 357 MBq 99mTc MIBI was injected. A rest scan was performed and the images were reviewed by a senior MIT, at which time the error was noticed and the procedure ceased. The effective dose for the rest scan was approximately 3.2 mSv. As a result of this incident, the chief nuclear medicine technologist implemented a new checklist for heart procedures including reviewing the referral before beginning the procedure. A new procedure was developed and implemented to review all referrals the night before the procedures to minimise future errors. |
| Incident 67 | A geotechnical company reported the theft of a utility vehicle from an employee’s residence. The vehicle was carrying a portable nuclear density/moisture gauge that the employee had been using earlier that day. The gauge incorporated about 300 MBq of caesium-137 and 1.5 GBq of americium-241/beryllium. The department was subsequently notified by Victoria Police that the stolen vehicle containing the gauge was found and returned to the licence holder. |
Incident 68
A radiation detection alarm was triggered at a landfill site. A staff member at the site advised that a truck had set off the alarm. A detector at the site showed that the material was ¹³¹Iodine (¹³¹I). The staff member advised that the truck driver told him that he (the driver) had been to a number of ‘old people’s homes’ collecting refuse. An officer from the department attended the landfill site. It was confirmed that the material that set off the alarm was contaminated with ¹³¹I, possibly from an incontinent elderly person who was being treated for thyroid disease.

The maximum dose at surface of the material was approximately 4 microsievert per hour (µSv/h). The material was buried in a permanent burial site at the landfill where it could safely decay.

Incident 69
A spill of some heavy mineral concentrate (HMC) associated with mineral sands mining occurred in a region of rural Victoria. Approximately 100 tonnes of HMC was accidentally released from a freight car along a significant length of the track used to transport the material.

The department conducted site investigations to verify the extent of the contamination and to confirm the subsequent clean up.

Incident 70
Two barium-133 sources were contained in a surplus gamma camera that was removed and subsequently scrapped by a company on behalf of a hospital. It is suspected that the barium-133 sources were scrapped with the camera and may have been sent to a smelter.

Pathways used by the scrap dealer were investigated and officers from the department interviewed hospital staff. The matter is still under investigation.

Incident 71
An organisation reported the detection of radioactive material on or beneath a pathway adjacent to a building at one of the organisation’s sites. The material was apparently detected during a part of a survey for radioactive material at the site. An officer from the department attended the site.

The pathway was composed of concrete tiles, and the radioactive material was suspected to be present in the soil beneath the tiles. A radiation survey with the tiles in situ did not allow the type of radioactive material to be identified. When the tiles were removed, the supporting soil was found to be contaminated with radium-226 (²²⁶Ra). ²²⁶Ra had been detected previously as a contaminant in another building at this site. The concrete tiles, which were removed to gain access to the supporting soil, were not contaminated. The risk arising from radiation exposure from the walkway was assessed to be negligible. However, future interventions requiring soil to be removed could present risks that require control. The area has been cordoned off in order to prevent a trip hazard. The department is working with the licence holder in relation to further investigations at the site.

Incident 72
The radiation detection alarm at a scrap metal company was triggered by a radioactive source. An officer from the department attended the site and determined that the source was an old industrial smoke detector containing less than 3.7 MBq of ²²⁶Ra. The dose rate at the surface was approximately 25 µSv/h. The smoke detector was subsequently taken by the department for storage.
Common acronyms and initialisms

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<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
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<tr>
<td>ACMA</td>
<td>Australian Communications and Media Authority</td>
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<tr>
<td>COAG</td>
<td>Council of Australian Governments</td>
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<td>CT</td>
<td>computed tomography</td>
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<td>medical imaging technologist</td>
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<td>National Directory for Radiation Protection</td>
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<td>radiology information system</td>
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Helpful resources


