THE ANNUAL REPORT OF

THE RADIATION ADVISORY COMMITTEE

FOR THE FINANCIAL YEAR ENDING JUNE 2008

RADIATION ADVISORY COMMITTEE
Melbourne, Australia

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Daniel Andrews MLA
Minister for Health

Dear Minister

Pursuant to Section 110 of the *Radiation Act 2005*, the Radiation Advisory Committee submits the 2008 annual report of the Committee for presentation to Parliament.

Yours faithfully

Dr John Heggie
Chair
RADIATION ADVISORY COMMITTEE

CONTENTS

RADIATION ADVISORY COMMITTEE

The Radiation Advisory Committee is established under Section 110 of the *Radiation Act 2005*. The term of appointment for the Committee was the period 17 August 2005 to 16 August 2008.

(i) Composition

The Radiation Advisory Committee met on 8 occasions from July 2007 to June 2008. The members of the Radiation Advisory Committee during this period were:

Dr. John Heggie (Chair)
Consultant medical physicist

Meetings attended: 6

Dr. David Bernshaw
Consultant Radiation Oncologist
Peter MacCallum Cancer Centre

Meetings attended: 7

Mr. Philip Brough
Chief Medical Imaging Technologist
Department of Medical Imaging
Geelong Hospital

Meetings attended: 6

Mr. Peter Burns
Director
Environmental and Radiation Health Branch
Australian Radiation Protection & Nuclear Safety Agency

Meetings attended: 6

Dr. Roslyn Drummond
Radiation Oncologist
Peter MacCallum Cancer Centre

Meetings attended: 8

Professor Robert Gibson
Deputy Head, Department of Radiology
University of Melbourne

Meetings attended: 5

Dr. Ken Joyner
Director
Global EME Strategy & Regulatory Affairs
Motorola Australia Pty Limited

Meetings attended: 3

Dr. Geza Benke
Research Fellow
Dept of Epidemiology & Preventive Medicine
Monash Medical School

Meetings attended: 5

(ii) Responsibilities

The Radiation Advisory Committee is to advise the Minister for Health or the Secretary of the Department of Human Services, on any matters relating to the administration of the *Radiation Act 2005*, referred to it by the Minister or the Secretary including the following:

(a) The promotion of radiation safety procedures and practices.

(b) Recommendation of the criteria for the licensing of persons and the qualifications, training or experience required for licensing.

(c) Recommendation of the criteria for the registration of radiation apparatus and sealed radioactive sources (from 1 September 2007, the system of registration of radiation sources was replaced by a system, under the *Radiation Act* 2007, of licensing to possess radiation sources).

(d) Recommendation of the nature, extent and frequency of tests to be conducted on radiation apparatus and sealed radioactive sources.

(e) Codes of practice, standards or guidelines with respect to particular radiation sources, radiation practices or uses.

Section 110 of the Radiation Act requires that the Committee must give the Minister a report on its activities during a financial year no later than 1 November following that year.

1. INTRODUCTION

Throughout the year a number of issues were considered by the Committee including:

- implementation of the *Radiation Act 2005*;
- the licensing and training requirements for various radiation practices;
- radiation incidents;
- non-ionising radiation matters; and
- a variety of research projects involving the irradiation of human volunteers.

The Committee would like to thank the Radiation Safety Section of the Department of Human Services for their continuing assistance and support.

2. IONISING RADIATION

2.1 Research involving irradiation of human volunteers

The Committee evaluated proposed research projects where doses to volunteers exceeded dose constraints specified in the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) *Code of Practice for the Exposure of Humans to Ionizing Radiation for Research Purposes 2005* and where there was no benefit to volunteers who are patients. Approval of other research projects involving radiation exposures of human volunteers was the responsibility of institutional human research ethics committees.

A list of the research projects considered by the Committee is provided in Appendix 1.

2.2 Radiation incidents

The Committee continued to review reports of radiation incidents, accidental radiation exposures and maladministrations reported to the Radiation Safety Section.

Of the reports of unplanned exposures, 13 involved an unintended computed tomography (CT) scan being performed on a patient, three involved a CT scan of the wrong region of a patient, seven involved the maladministration of a radiopharmaceutical to a patient, one involved the use of a fluoroscopy unit by an unlicensed medical practitioner in a hospital. In addition, one incident involved the unauthorised adjustment of the profile parameters of a linear accelerator by a medical physicist and one was a hoax incident attended by Radiation Safety Section officers at a Melbourne student college that involved the dispersal of innocuous granules. Common causes of the medical accidental exposures were found to be failure of staff members to follow correct patient identification procedures and incorrect protocols being used for scans. Follow-up actions by practices designed to prevent recurrences were monitored. Information was circulated to medical practices generally explaining common errors that can lead to radiation incidents.

The Committee believes that, in the interests of open reporting, the identification of staff members involved in incorrect exposures should not be mandatory.

A list of incidents, accidental exposures and maladministrations is provided in Appendix 2.

Pie charts summarising the incidents involving CT scans and radiopharmaceuticals are provided in Appendices 5 and 6 respectively.

2.3 Time-out forms for patient identification developed by Radiation Safety Section

The Committee was presented with copies of the 'time-out' forms filled out by radiographers at Barwon Medical Imaging and the Royal Melbourne Hospital prior to CT scans. The forms are used for the purposes of patient identification. The Committee was advised that the Radiation Safety Section had developed a generic CT time-out form based on these that could be used by radiology practices as part of their patient identification procedures. This is included in Appendix 3. The Radiation Safety Section had also developed a generic nuclear medicine time-out form. This is included in Appendix 4.

2.4 Training of radiation apparatus operators

A Melbourne company provided a submission to the Radiation Safety Section requesting approval of a training course for the use of mini C-arm fluoroscopy equipment.

The course had been prepared by the company in conjunction with the medical imaging department of a Melbourne hospital. The Committee was informed that the course was initially intended to provide training to orthopaedic surgeons and other medical specialists operating at the hospital to allow them to gain a licence to use mini C-arm fluoroscopy equipment. It had been indicated by the company that they would consider providing the course to other medical specialists at other institutions if a demand became apparent.

The Committee believed that the course content was generally of a high standard and would provide a good basis for the safe operation of mini C-arm fluoroscopy equipment for imaging of extremities. However, the Committee recommended that it would be beneficial for the course material and associated test questions to be reviewed by an independent medical physicist.

Subject to recommendations of this review, the course would provide a basis for the licensing of medical specialists to use the mini C-arm fluoroscopy equipment.

2.5 Radiation safety standard for mammography equipment

The Committee was requested to review a proposal to amend the current radiation safety standard for mammography equipment to allow for the testing of digital mammography equipment.

The Radiation Safety Section had proposed to amend the existing radiation safety standard for mammography equipment to include tests for digital equipment based on the Australasian College of Physical Scientists and Engineers in Medicine (ACPSEM) position paper *Interim recommendations for a digital mammography quality assurance program.*

The Committee noted that these recommendations had already been adopted by Breastscreen Victoria and agreed that it would be appropriate to use this paper as the basis for tests to be conducted on digital mammography equipment.

2.6 Changes to requirements regarding dental radiography

The Committee was informed that the Radiation Safety Section was reviewing licensing arrangement for dentists who use dental radiography equipment, in particular cone beam volumetric dental CT equipment.

The Radiation Safety Section proposed to permit dentists to conduct radiography using cone beam volumetric dental CT equipment only where they have undertaken appropriate training. The Committee was informed that this would result in the following changes to the current arrangements:

- Licences normally issued to dentists would permit intraoral and panoramic dental radiography only.
- Dentists wishing to conduct radiography using cone beam volumetric dental CT equipment would need to provide evidence of training appropriate to this equipment.

The Committee noted that up to this time only radiographers, oral surgeons, and dental specialists were permitted to use cone beam volumetric dental CT equipment. It was agreed that changes to the arrangements to make them consistent with other states, and permit only appropriately trained persons to used this equipment was beneficial.

The Committee was advised that the Radiation Regulators Forum, which consists of the radiation regulators of the Commonwealth and the states and territories, will develop a set of requirements for dentists to use extra-oral dental equipment (including cone beam volumetric units), for presentation to the Radiation Health Committee of ARPANSA. The requirements will most likely be that the person must be registered with the appropriate dental board and have received appropriate training in the equipment to be used.

2.7 Request for one radiographer to staff two cardiac suites at a Melbourne hospital

The Committee was advised that the Radiation Safety Section had received a request from a Melbourne hospital requesting that they be permitted to use one radiographer to staff two cardiac suites simultaneously at their centre.

The two suites in the submission included one for cardiac catheterisation and one for electro-physiology studies and implantation of internal cardiac devices such as pacemakers. In the submission, the proponent stated that it was unreasonable to keep a radiographer permanently in the implantation laboratory because the radiographer was only required to reset the fluoroscopy timer alarm every five minutes.

The Committee believed that the role of the radiographer should include more than simply resetting the fluoroscopy timer alarm. The Committee believed that radiographer's role in the screening procedure appeared to have been lessened and that due consideration had not been given to optimisation of radiation exposures during screening procedures.

The Committee agreed that any proposal for simultaneous staffing of two fluoroscopy procedures by one radiographer could be considered only if the two procedures were being conducted in directly adjoining rooms, between which immediate access was permitted. As this was not the case in the proponent's centre, the committee agreed that it would not be appropriate to allow only one radiographer to staff both rooms.

2.8 Licensing requirements for various medical professions

The Radiation Safety Section (RSS) sought advice from the Committee on a proposal to issue interim licences to medical specialists wishing to gain a use licence but who had not completed the pre-requisite training.

The Committee was advised that the RSS from time to time receives applications for use licence from medical specialists, primarily wishing to operate fluoroscopy equipment. However, due to the sporadic availability of approved training courses, there was a significant waiting time for those wishing to undertake training. The RSS put forward a proposal that a one year licence be issued to persons who could not undertake training prior to applying for the licence. The licence, however, would not be automatically renewed unless there was evidence that the licence holder had undergone appropriate training.

The Committee endorsed this proposal but was concerned that the number of available courses would not be able to meet the demand from the medical specialists.

The Committee recommended that the RSS look at the number of medical specialists who may wish to undergo training and give this information to training providers so that they can plan the delivery of courses accordingly. It was also suggested that the use of interstate training providers be investigated.

2.9 Overview of the changes to the system of radiation protection (ICRP 2007)

The Committee was presented with an overview of changes to the system of radiation protection that were introduced by the International Commission on Radiological Protection (ICRP) in 2007. The changes take into account new biological and physical information and trends in the setting of radiation safety standards; they improve and streamline the presentation of the recommendations; and they maintain as much stability in the recommendations as is consistent with the new scientific information.

Among the main changes are:

- Where the 1990 ICRP recommendations related to human activities that were divided into "practices" and "interventions", the 2007 recommendations are to be applied to the following three types of exposure situations:
  - Planned Exposure Situations.
  - Emergency Exposure Situations.
  - Existing Exposure Situations.
- The new recommendations emphasise that optimisation is now the primary tool for radiation protection and ICRP has defined three bands of constraints and reference levels (expressed as levels of projected effective dose):
  - 20 to 100 mSv - unusual and extreme situations.
  - 1 to 20 mSv - individuals receive direct benefit.
  - less than 1 mSv - applies to exposures where individuals receive no direct benefit.
- Changes in the radiation weighting factors for protons and neutrons.
- Changes in the tissue weighting factors.

2.10 Consultative paper from Australian Commission on Safety and Quality in Healthcare

The Committee was informed that the Australian Commission on Safety and Quality in Healthcare had published a consultation paper entitled *Expanding the Ensuring correct patient, correct site, correct procedure protocol*.

The Committee noted that the paper provided protocols for identification of patient prior to undergoing radiology, nuclear medicine, radiotherapy and oral health procedures. Features of the protocols were the "3 Ws" ("Who are you? What is your date of birth? What are you here for?") It was also noted that the time-out procedure was included in the protocols.

The Committee requested that a submission be made to the Commission, including some examples of time-out questionnaires already used in radiology and nuclear medicine centres.

2.11 Supervision of radiography students

The Committee was advised that a university involved in the training of radiography students had raised concerns regarding the current standard of supervision of students.

In the correspondence, it was noted that feedback from students indicated that they were being left to correct images that were of poor quality without supervision by a registered radiographer. It was asserted that this was leading to an unacceptable number of needless repeat radiographs being performed on patients. It was also noted that the Radiation Safety Section had previously published an information sheet entitled *Guidelines for diagnostic radiography, radiation therapy and nuclear medicine technology students, interns and professional development year trainees*. This sheet is available at the following address:

http://www.health.vic.gov.au/environment/downloads/radiation/guidelines_student.pdf

The Committee noted that point 7 of the guidelines recommended a high level of supervision for students requesting or undertaking repeat radiographs.

The Committee requested that the Radiation Safety Section write to hospitals that may have dealings with radiography students in clinical placements, reminding them of the guidelines and the need to minimise the number of repeat radiographs performed.

2.12 Application for use licence from an overseas-trained radiologist

The Committee was advised that the Radiation Safety Section had received an application for a use licence from an overseas-trained radiologist. The Radiation Safety Section was seeking advice as to whether the applicant should be granted a use licence to perform fluoroscopy.

The Committee was reminded that the current pre-requisites for use licence for radiologists were registration with the Medical Practice Board of Victoria, and eligibility for membership of the RANZCR. Whilst it appeared that the radiologist did not immediately meet the prerequisites for licence, it was considered that he may be competent to use fluoroscopy equipment due to overseas training and previous experience.

It was noted that the applicant was a registered specialist with the Australian Medical Council (AMC). The Committee recommended that the Radiation Safety Section investigate the requirements for becoming a registered specialist with the AMC, and the appropriateness of accepting that registration as evidence of competency for licensing purposes. The Committee requested to be advised of the results of this investigation.

3. NON-IONISING RADIATION

3.1 Residential exposure to electric power transmission lines and risk of lymphoproliferative and myeloproliferative disorders

Lowenthal et al (*Residential exposure to electric power transmission lines and risk of lymphoproliferative and myeloproliferative disorders: a case-control study*. Internal Medicine Journal, Vol. 37, 2007: 614 – 619) presented results of a case–control study of 854 patients diagnosed with lymphoproliferative disorders (LPD) or myeloproliferative disorders (MPD - including leukaemia, lymphoma and related conditions) aged 0–94 years and comprising all cases diagnosed in Tasmania between 1972 and 1980. Controls were individually matched for sex and approximate age at the time of diagnosis. Compared with those who had always lived >300 m from a power line, those who had ever lived within 50 m had an odds ratio (OR) of 2.06 (95% confidence interval [CI] = 0.87-4.91) for developing LPD or MPD, based on 768 adult case-control pairs. Those who had lived between 50 and 300 m had an OR of 1.30; 95% CI = 0.88-1.91. Adults who had lived within 300 m of a power line during the first 15 years of life had an OR of 3.23; 95% CI = 1.26-8.29; those who had lived within the same distance aged 0–5 years had an OR of 4.74; 95% CI = 0.98-22.9. The only one of the above ORs that is statistically significant is that for adults who had lived within 300 m of a power line during the first 15 years of life. The authors concluded that the results raise the possibility that prolonged residence close to high-voltage power lines, especially early in life, may increase the risk of the development of MPD and LPD later. They recognised, however, that this study has limitations. In particular, there are the continuing problems of bias due to the selection of controls and the fact that distance from power lines is a poor indicator of exposure to power frequency electromagnetic fields.

3.2 Regulation of Solaria in Victoria

The Committee was updated on the development of proposed regulations regarding the use of solaria.

On 23 August 2007, the Minister for Health, the Hon Daniel Andrews MP, made a commitment to have regulations controlling solaria in place by the end of the year. The development of a full regulatory impact statement in order for the intended regulations to be in place by the end of 2007 was not possible and an exemption from this requirement was sought and obtained. Interim regulations were developed that prescribed “tanning units” as non-ionising radiation apparatus. Under the interim regulations, a management licence was required to possess tanning units and conditions were placed on these licences that required compliance with requirements of the Australian/New Zealand Standard AS/NZS 2635:2002, *Solaria for cosmetic purposes*. Further regulations with a regulatory impact statement were developed during 2008.

The Committee was presented with a summary of the outcomes from the National Forum on the Impacts of Regulating Solaria, held on 20 November 2007.

Representatives participating in the Forum agreed that the following matters should be examined for uniform regulatory application in relation to the operation of commercial solaria in each jurisdiction:

1. Persons under 18 years of age to be prohibited from using solaria.
2. Skin type required to be assessed with persons of skin type I to be discouraged/prohibited from being exposed.
3. Training to be required for solarium operators, including training in assessing skin type.
4. Supervision to be a required component of solarium operation.
5. Informed consent of clients to be a requirement of solarium operation.
6. Total exposure and/or frequency of repeat exposure in a solarium to be restricted.

The Radiation Health Committee was requested to develop a process to put this agreement into an appropriate form and level of detail for regulatory adoption by all jurisdictions, and to manage the timetable for its development. The meeting noted that the detail could draw on information from the Australian/New Zealand Standard and that preparation of a new section for inclusion in the National Directory for Radiation Protection would be an appropriate means of developing a uniform approach.

It was agreed that ARPANSA would work with Victoria to develop a regulatory impact statement that would be suitable nationally to avoid duplication of effort. It was noted that such a process would need to take account of differences between jurisdictions, particularly in relation to differences in solar exposure compared with solarium exposure at different latitudes.

3.3 Mobile phone use, exposure to radiofrequency electromagnetic field, and brain tumour: a case-control study (Japanese interphone study)

A study by Takebayashi et al (*Mobile phone use, exposure to radiofrequency electromagnetic field, and brain tumour: a case-control study*. Br J Cancer (2008) **98**: 652-659) of brain cancer in relation to mobile phone use estimated the specific absorption rate (SAR) inside brain tumours, taking into account spatial relationships between tumour localisation and intracranial radiofrequency distribution. Personal interviews were carried out for 88 patients with glioma, 132 with meningioma, and 102 with pituitary adenoma (322 cases in total), and with 683 individually matched controls. All maximal SAR values were below 0.1 Wkg^{-1}, far lower than the level at which thermal effects may occur. The adjusted odds ratios (ORs) for regular mobile phone users were 1.22 (95% confidence interval 0.63-2.37) for glioma, 0.70 (0.42-1.16) for meningioma and 0.90 (0.50-1.61) for pituitary adenoma. When the maximal SAR value inside the tumour tissue was accounted for in the exposure indices, the overall OR was again not increased. A non-significant increase in OR among glioma patients in the heavily exposed group may reflect recall bias.

3.4 The Committee's view on possible health effects of power frequency electromagnetic fields.

The additional evidence reviewed by the Committee concerning possible health effects of power frequency electromagnetic fields has not altered the Committee's position that based on the total database of scientific research, there is insufficient evidence to conclude that exposure to normally encountered environmental levels causes adverse health effects in humans.

3.5 The Committee's view on possible health effects of radiofrequency radiation

The Committee considers there is no substantive evidence to suggest that exposure to radiofrequency radiation can increase the risk of chronic health effects such as cancer. However, the Committee acknowledges the current controversy over mobile phones and their base stations and will continue to review the relevant research literature.

APPENDIX 1 RESEARCH PROJECTS CONSIDERED BY THE COMMITTEE

TITLE OF RESEARCH PROJECT
A prospective, randomised, double-blind, placebo-controlled, parallel-group, international multi-centre phase III trial of PI-88 in the adjuvant treatment of post-resection hepatocellular carcinoma. This research project was not approved because participants were expected to receive a total effective dose of 288 mSv as a result of these procedures. Participants included a placebo control group who would not receive a medical benefit.
An International, Randomized, Double-blind, placebo controlled, Phase 2 study of AMG 479 with Exemestane or Fulvestrant in Postmenopausal Women with Hormone Receptor Positive Locally Advanced or Metastatic Breast Cancer. This study was approved subject to amendments to the Patient Information and Consent Forms.
Amyloid-beta imaging with ZK 6013443 ([F-18]AV1/ZK) positron emission tomography for early detection of Alzheimer's disease in patients with amnestic mild cognitive impairment. The Committee approved the research proposal, subject to the researchers obtaining full approval from the hospital's Human Research and Ethics Committee.

APPENDIX 2 INCIDENTS, ACCIDENTAL EXPOSURES AND MALADMINISTRATIONS REPORTED TO THE COMMITTEE

DESCRIPTION OF INCIDENT	ACTION TAKEN
An 18 year-old male patient presented for a CT scan of the thoracic spine. The clinical notes for the patient indicated that a radiograph was required. The referral requested that a CT scan be performed and a protocol for this procedure was subsequently drawn up by a radiologist. The clinical notes indicated that the patient had clinical indications in both the thoracic and cervical spine, but the scan referral did not indicate which area needed to be scanned. The radiographer performed the CT scan as per the protocol. The medical intern who requested the scan had made the request for the wrong area of the spine. The total effective dose to the patient was approximately 7.2 mSv as a result of the scan.	A report on the maladministration indicated that it would be desirable for a senior medical practitioner to request images if possible or ensure that junior practitioners understand the reasons for and intended benefit of scans that they request.
A 56 year-old female patient underwent an unnecessary CT scan of the brain. The patient had been scheduled to undergo a radiograph, but was conducted into the CT room by mistake. The radiographer conducting the scan checked the identity wrist-band of the patient, but did not compare it with the name on the request form for the CT scan. The total effective dose to the patient was approximately 3.4 mSv as a result of the scan.	RSS advised the hospital to introduce a 'time-out' policy in relation to the verification of patient identity and scan protocols, as had been introduced at some other major hospitals in Victoria. The Committee noted that time-out procedures require radiographers and nuclear medicine technologists to verify the identity of the patient, the modality to be used for imaging and the region of the body to be imaged.
A 57 year-old male patient underwent an administration of 200 MBq gallium-67 citrate, although he had actually been scheduled to undergo a myocardial viability test using thallous chloride. The error occurred because the nuclear medicine technologist that was performing the scan misread the label on the vial containing the radiopharmaceutical and incorrectly assumed that thallous chloride was the agent that was being drawn up and injected. The patient received a total effective dose of approximately 20 mSv as a result of the maladministration.	The chief nuclear medicine technologist at the department counselled the technologist who made the error about the importance of verifying that the correct radiopharmaceutical is drawn up and administered. As an interim measure pending the completion of an internal review, vials of gallium citrate and thallous chloride were kept in separate, appropriately labelled lead castles. RSS requested that the nuclear medicine department of the hospital implement double-checking of radiopharmaceutical identification by a second technologist.

DESCRIPTION OF INCIDENT	ACTION TAKEN
Doses of radiopharmaceuticals for both a bone scan (99mTc-HDP) dose and a gastric emptying procedure were drawn up in the nuclear medicine laboratory of a hospital. The dose for the bone scan was inadvertently added to the porridge meal that had been intended for the gastric emptying procedure. The patient received approximately 5 mSv total effective dose as a result of this scan. However the Committee noted that this could only be considered an approximation as the calculation was likely to be based on the dose coefficient for injection of 99mTc-HDP, as a value for ingestion is not thought to be available.	The technologist was advised to take care and label all radiopharmaceuticals that are drawn up and are waiting to be administered. RSS requested that the nuclear medicine department of the hospital implement double-checking of radiopharmaceutical identification by a second technologist. The Committee agreed that the centre should implement a 'time-out' procedure to reduce the possibility of similar errors occurring in the future.
A 71 year-old female patient had undergone a CT examination of the brain twice, although only one examination had been intended. The cause of this error was the request form being faxed twice to the radiology department by mistake because the original appointment for the scan had been cancelled. The patient received a total effective dose of approximately 1.8 mSv as a result of the unnecessary scan.	RSS advised the hospital to ensure any request slips for CT procedures that are faxed are stamped to indicate that they have been faxed.
A 34 year-old female patient had undergone an unnecessary CT scan of the brain. This had occurred because the request slip had been faxed to two hospitals, which caused a booking to be made at both hospitals for the same scan. The patient received a total effective dose of approximately 1.8 mSv as a result of the unnecessary scan.	RSS advised the hospital to ensure any request slips for CT procedures that are faxed are stamped to indicate that they have been faxed.
Three patients were administered 740 MBq 99mTc-pertechnatate by mistake. The cause of this error had been that the vial containing the radiopharmaceutical had been incorrectly labelled. Three doses were drawn up and administered from the vial, with the error only being recognised during an attempt to perform the intended bone scan. Each patient received a total effective dose of approximately 9.6 mSv as a result of the maladministrations.	RSS requested the institution to forward details as to the reason for the incorrect labelling of the vial.

DESCRIPTION OF INCIDENT	ACTION TAKEN
A 57 year-old female patient underwent a CT scan of the chest with contrast. This had occurred because the patient mistakenly answered to a name that was called in the waiting room that sounded similar to her own name. The radiographers concerned failed to verify the identity of the patient prior to the scan in accordance with the hospital's patient identification procedure. The Radiation Safety Officer for the hospital estimated that the patient received a total effective dose of approximately 4.2 mSv as a result of the unnecessary scan.	A meeting was held of radiographers in the radiology department to re-iterate the importance of taking extra care in identifying patients in a busy environment, as per the hospital's patient identification procedure. A 'time-out' form was to be developed for identification of patients prior to CT scans at the hospital. The Committee noted that the efforts of the radiographer correctly follow the patient identification procedure had appeared to be inadequate.
The Radiation Safety Section received a call-out to student accommodation premises for the University of Melbourne. The Metropolitan Fire Brigade reported a suspected deliberate contamination of a recreation room with a large amount of granulated powder.	Two officers from the Radiation Safety Section attended the scene and performed monitoring of samples taken from the room. This monitoring showed no evidence of radioactivity above background levels.
An 80 year-old male patient had undergone an unnecessary CT scan of the abdomen. This had been due to the placement of an incorrect patient identification sticker onto the request form by a medical intern. The data provided in the report were insufficient to allow estimation of the total effective dose received by the patient.	A surgical consultant was asked to review the request practices of the intern involved in order to reduce the risk of a similar mistake occurring in the future. The hospital also initiated a review of the process for management of patient histories and diagnostic requests. The Committee recommended that the Radiation Safety Officer of the Hospital provide the relevant data to a medical physicist so that a dose estimate could be performed. The Committee further recommended that a process of hand-writing of names on request forms, in addition to attachment of identification labels, be implemented to reduce the risk of similar incidents occurring in the future.

DESCRIPTION OF INCIDENT	ACTION TAKEN
A fluoroscopy unit at a Melbourne hospital was used in an unauthorised manner by an individual who was not licensed to do so. A radiographer had finished one screening session and was required for another session but had another urgent case that she had to attend to in the interim. She therefore left the unit switched on with the key in place. On returning from the urgent case she discovered that the unit had been used in her absence.	In response to the incident, the hospital has advised all staff working in the hospital's operating theatres about the correct procedure regarding licensed us of fluoroscopy units. Radiographers at the hospital have been reminded to disable an unattended image intensifier and a sign has been placed on all mobile fluoroscopy units to remind staff that the machine must be only be used by a licensed operator.
A 60 year-old male patient underwent a CT scan of the brain without contrast, when it had been intended that the patient receive a CT scan of the brain with contrast. The patient received a total effective dose of approximately 1.4 mSv as a result of the scan.	Radiation Safety Section (RSS) wrote to the hospital acknowledging their report. RSS advised that the report did not indicate whether or not the hospitals established time-out procedure was followed in this case. The Committee sought clarification on this.
A 60 year-old female patient underwent a CT scan of the brain that had been intended to evaluate a stroke that a patient had suffered. When the scan was performed it was noticed that the patient had a brain tumour. The referring physician was advised after the scan to see if he had attached the correct patient identification label. The physician had indicated that he asked someone else to attach a patient ID sticker to the request form as he could not find one. The incident was reported as a sentinel event within the hospital's internal incident reporting system, and the physician concerned was notified of the error. The patient concerned was notified of the incident. The total effective dose to the patient as a result of the scan was approximately 1.96 mSv.	The Committee recommended that the hospital encourage hand-writing of patient names on request forms in addition to attaching patient identification stickers. It also requested RSS to forward a summary of medical radiation incidents to the Medical Practitioners Board of Victoria, once they had been complied for the 2008 annual report of the Committee.

DESCRIPTION OF INCIDENT	ACTION TAKEN
A 50 year-old male patient had been scheduled to undergo an administration of ^{99m}Tc MAG3 for a renal study at a private imaging centre. The scan scheduled prior to this patient's booking was a bone scan using ^{99m}Tc HDP and the injection trolley had been prepared for this injection. However the bone scan patient was running late, so the renal patient was scanned instead. The nuclear medicine technologist concerned did not replace the dose of ^{99m}Tc HDP with the dose of ^{99m}Tc MAG3 and did not check the dose sticker provided prior to injection. As a result the patient concerned was administered with 840 MBq ^{99m}Tc HDP. The total effective dose received by the patient as a result of the maladministration was approximately 4.6 mSv. The patient was advised of the error.	The Committee recommended that the centre adopt a time-out procedure that involves the checking of the pharmaceutical, isotope, and activity prior to administration. The Committee recommended that the Radiation Safety Section assist the in developing a time-out procedure.
An incident occurred on a radiotherapy linear accelerator at the rural oncology centre on 1 January 2008 involving the unauthorised adjustment of beam profile parameters. The alterations to the accelerator were discovered while work was being carried out on the accelerator on 2 January 2008. Settings on potentiometers on the 6MV program board had been changed from the values recorded during the previous service. It was ascertained that the alterations were carried out by a physicist at the centre. The accelerator's internal control system was able to maintain the beam geometry during subsequent patient treatments and the self checking system was able to prevent any clinically significant consequences to any patients.	The centre instituted a rehabilitation program for the physicist concerned. The physicist was placed on a two year probation and his performance was to be closely monitored by his supervisor. His progress was also to be reviewed by a disciplinary panel.

DESCRIPTION OF INCIDENT	ACTION TAKEN
A 36 year-old male patient unintentionally underwent a CT scan of the brain/face. At the time, however, the patient had been scheduled to undergo a CT scan of the face/cervical spine. The radiographer performing the scan had been interrupted a number of times by doctors, and it appears that the e-request form for the intended procedure got mixed up with other forms. The radiographer did not re-check the form before the scan. The total effective dose received by the patient as a result of the scan was approximately 3.1 mSv. The patient had been informed of the error.	The Committee recommended that the hospital involved be sent sample time-out procedure out forms.
A 51 year-old female patient unintentionally underwent a CT scan of the brain. At the time, however, the patient had been scheduled to undergo a CT scan of the chest. There had been a mix-up with patient details, and staff involved did not correctly follow the centre's identification policy. The patient received a total effective dose of approximately 1.5 mSv as a result of the incorrect scan.	The Committee requested that the Radiation Safety Section write to institution acknowledging the report.
A 6 year-old female patient underwent a CT scan of the abdomen and chest instead of the intended CT scan of only the abdomen, as intended. An incorrect CT protocol was used because the radiographer involved had been interrupted by reception staff on the phone, notifying of arriving patients. The total effective dose to the patient as a result of the unnecessary was approximately 3.5 mSv.	The Committee requested that the Radiation Safety Section write to the hospital suggesting that a time-out procedure may have been helpful in his case.

DESCRIPTION OF INCIDENT	ACTION TAKEN
A 73 year-old male patient had wrongly undergone an administration of 820 MBq Tc-99m HDP. This had occurred because the person that was scanned answered a call made in the waiting room of the centre for another patient. The patient was asked to confirm the date of birth that was provided to him by the staff member. The patient was also asked about previous bone scans. The patient answered "yes" to all questions that were asked by the staff member. After the patient had been injected with the radiopharmaceutical it was realised that the incorrect patient had been injected, as the patient had actually been scheduled for a DEXA scan.	The Committee recommended that the institution be advised that closed questions should not be used during verification of patient identity but that the patient should be asked to provide identifying details themselves. It was also suggested that nuclear medicine patients be kept separate from patients waiting for other types of procedures. In addition, it was suggested that the time-out procedure would have been beneficial if properly followed in this case.
On 18 March 2008 a 67 year-old male patient was referred by two different physicians to undergo two separate CT scans at a Melbourne hospital. The first scan was of the abdomen and was scheduled for March 2008. This scan was performed as intended. The second scan, of the chest, was scheduled for October 2008. Referral slips for both scans were given to a radiographer. The radiographer then performed both scans, as the date on the referrals was not checked. Consequently the scan that was scheduled for October 2008 was performed in error. The total effective dose to the patient as a result of the CT chest scan was approximately 6 to 8 mSv.	In response to this case the administrative staff and the radiographer involved have been reminded to check both the date of the referral and the date of the examination provided on referral slips. The Committee agreed that a time-out procedure conducted prior to the CT scan may have assisted in this situation. The Committee did acknowledge that a time-out procedure may not have prevented this incident but requested that the Radiation Safety Section send the hospital sample time-out forms for their consideration.
On 26 February 2008, a 70 year-old female patient underwent a CT scan of the chest, abdomen, and pelvis with contrast. The patient had actually been referred from the emergency department of the hospital to undergo an ultrasound scan. The radiographer who performed the CT scan verbally identified the patient but the identification was incorrect. The patient was subsequently informed of the error. The total effective dose to the patient as of a result of the CT scan was approximately 18.6 mSv.	In response to the incident, a new patient identification policy was developed by the hospital. In addition, radiation incidents are to be discussed at the monthly medical imaging quality meetings. The Committee acknowledged that the incident occurred prior to a letter sent to the hospital that included a suggested time-out form for CT procedures. The Committee requested the Radiation Safety Section to obtain a copy of the new patient identification policy developed by the hospital.

DESCRIPTION OF INCIDENT	ACTION TAKEN
On 29 February 2008, a patient at a Melbourne hospital received an unnecessary repeat CT scan of the chest four days after the original scan. The effective dose to the patient as a result of the chest CT scan was approximately 6.3 mSv.	The Committee could not determine if the repeat CT scan of the chest occurred as a result of one request form being issued twice or two request forms being issued for one examination. The Committee has requested to be informed of the outcome of the investigation of this incident. The Committee requested that the Radiation Safety Section write to the hospital seeking information detailing the outcome of the investigation of the incident.
On 3 March 2008 a 70 year-old female patient at a Melbourne hospital was administered an incorrect radiopharmaceutical whilst undergoing a cardiac stress test. It had been intended that the patient would be administered with 400 MBq 99mTc-MIBI. The dose for the procedure was drawn up by an intern who was not under supervision at the time. The dose was calibrated and the dose slip was printed as 'MIBI'. Upon scanning the patient the staff saw that the target organ was the brain rather than the heart as had been intended. As a result of the maladministration, the cardiac procedure had to be repeated on the patient. The total effective dose to the patient as a result of the maladministration was approximately 5.2 mSv.	In response to the incident, the intern concerned was given instructions to identify radiopharmaceuticals prior to dispensing. It was also indicated that supervision of interns whilst dispensing radiopharmaceuticals would be intensified in the short term.

DESCRIPTION OF INCIDENT	ACTION TAKEN
A 61 year-old female patient unintentionally received a CT scan of the cervical spine. The patient had required, and received, plain radiographic investigation of the cervical spine. The referral slip for this procedure had requested that the general radiographer call the CT radiographer once the radiographs were complete. This had been intended to determine the need for a further CT based on the plain radiographs, in consultation with the referring practitioner. The general radiographer incorrectly communicated to the CT radiographer that the patient was to undergo a CT scan. The referral slip had not been protocolled for a CT scan. The time-out procedure was followed by the CT radiographer who assumed, however, that notes made by the general radiographer on the referral slip were a CT protocol made by the radiology registrar. The patient received a total effective dose of approximately 7.5 mSv as a result of the unnecessary scan.	The Committee noted the report and expressed its disappointment that the time-out procedure followed by the CT radiographer failed to prevent the unnecessary scan.
A 37 year-old male patient was referred from a Melbourne hospital to undergo a nuclear medicine scan at a facility on site at the hospital. The referring medical practitioner, however, attached an incorrect patient identification label on the request form. The patient was administered with 215 MBq 99mTc DIDA. Some time after the scan was performed, a surgical registrar from the hospital rang the nuclear medicine centre and this was when the mistake was discovered. The patient received a total effective dose of approximately 3.7 mSv as a result of the scan.	The Committee noted the report and requested that the Radiation Safety Section write to the hospital acknowledging the report.

DESCRIPTION OF INCIDENT	ACTION TAKEN
A 35 year-old male was bought from the emergency department of the hospital to the radiology department for a CT scan. The CT assistant had brought the patient in having read the referral and details. The patient provided his name, which was different to what the assistant had read out to him, however the assistant did not pick this up. The CT radiographer had then asked the patient if his date of birth was 15.10.1967 to which he replied yes. This response was not correct, and the date provided by the radiographer was not the date that patient had provided. The CT scan was then undertaken, and it had later become evident that patient was actually scheduled for a knee radiograph. The total effective dose to the patient as a result of the unnecessary scan was approximately 9 mSv.	The Committee noted the report and requested that the Radiation Safety Section write to MIA Victoria recommending the implementation of a time-out procedure. **Action:** *Radiation Safety Section to write to MIA Victoria Pty Ltd (Werribee Mercy* Hospital*) recommending the adoption of a time-out procedure.*
A 49 year-old male patient had been referred by a general practitioner to a Melbourne hospital to undergo a CT scan of the cervical spine. The attending radiographer, however, performed a CT scan of the lumbar spine. A report from the hospital indicated that the radiographer did not thoroughly check the request form for the procedure. The total effective dose to the patient as a result of the unintended scan was estimated to be approximately 19 mSv.	The Committee noted the report and requested that the hospital provide details of measures that they had taken to prevent a similar incident occurring in the future. In addition, the Committee recommended that the hospital implement a time-out procedure for CT scans.

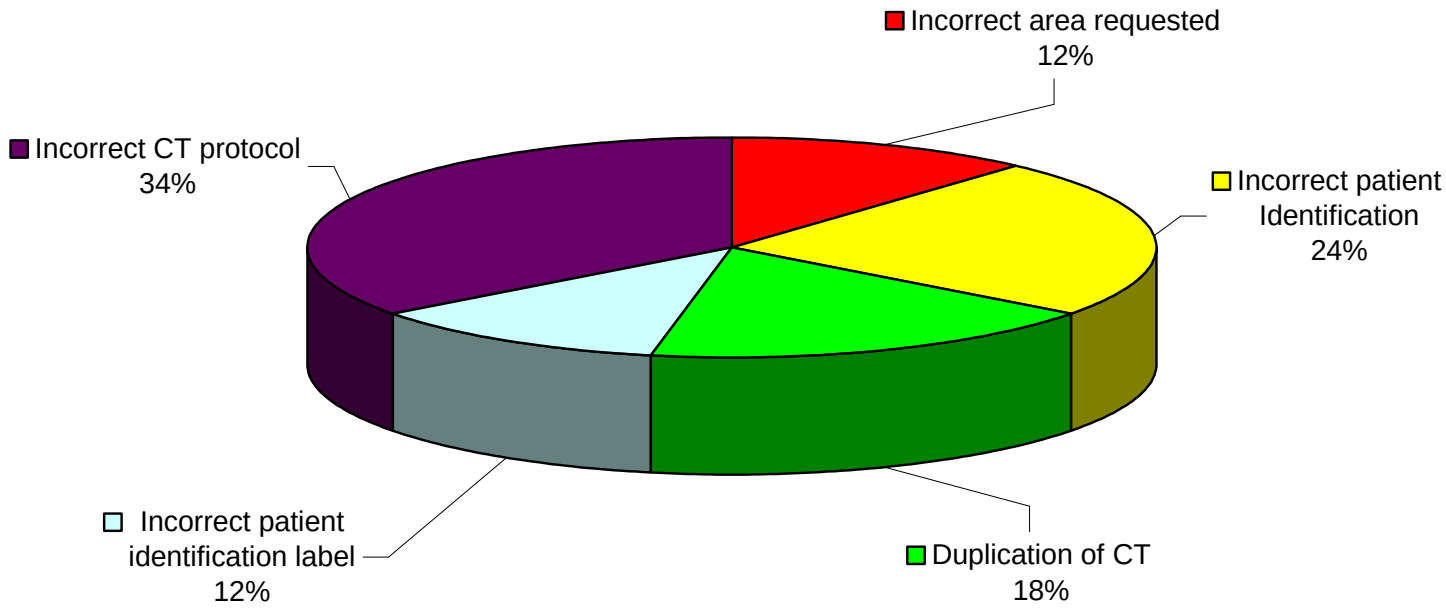
APPENDIX 3 SAMPLE TIME-OUT SHEET DEVELOPED BY THE RADIATION SAFETY SECTION FOR CT PROCEDURES

	Suggested CT time-out form **To be completed before proceeding with scan**
	Patient Name or UR number_____ Date_____
❑ Yes	**1 Verify patient identity** H*ave you verified you have the correct patient by Name, UR and date of birth, and address:* *(Ideally verification should be by at least three of the four key identifiers)*
❑ Yes	**2 Verify** ❑**a) Modality and** ❑**b) region** *Have you verified that the modality to be used and the body part to be imaged are as stated in the request?*
❑ Yes	**3. Request - Protocol** *Has the request slip been verified according to clinical protocol?*
	*If you answered yes to all questions, proceed with the examination.* *If you cannot answer yes to all of the questions **STOP** and seek confirmation from relevant staff* *Two radiographers should sign off whenever possible* Staff initials _____ _____

APPENDIX 4 SAMPLE TIME-OUT SHEET DEVELOPED BY THE RADIATION SAFETY SECTION FOR NUCLEAR MEDICINE PROCEDURES

	Suggested nuclear medicine time-out form **To be completed before proceeding with scan**
	Patient Name or UR number_____ Date_____
❑ Yes	**1 Verify patient identity** *Have you verified you have the correct patient by Name, UR and date of birth, and address:* *(Ideally verification should be by at least three of the four key identifiers)*
❑ Yes	**2 Verify** **❑ a) isotope and** **❑ b) activity and** **❑ c) pharmaceutical** *Have you verified that the modality to be used and the body part to be imaged are as stated in the request?*
❑ Yes	**3. Request - Protocol** *Has the request slip been verified according to clinical protocol?*
	*If you answered yes to all questions, proceed with the examination.* *If you cannot answer yes to all of the questions **STOP** and seek confirmation from relevant staff* *Two nuclear medicine technologists should sign off whenever possible* Staff initials _____ _____

APPENDIX 5 ANALYSIS OF CT INCIDENTS IN VICTORIA 2007-08



APPENDIX 6 ANALYSIS OF INCIDENTS INVOLVING RADIOPHARMACEUTICALS IN VICTORIA 2007-08