STANDARD OPERATING PROCEDURE FOR
COMPUTED TOMOGRAPHY (CT)

ALBURY WODONGA HEALTH
WODONGA CAMPUS
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GLOSSARY OF TERMS IN THIS STANDARD OPERATING PROCEDURE:

Australian Health Practitioner Regulation Agency (AHPRA):
The Health Professional council area regularity body who function is to maintaining and publishing a public register of properly qualified members of the professions. They approve and uphold high standards of education and training and investigating complaints and taking appropriate action.

ALARA:
As Low As Reasonably Achievable:
Radiation must be kept As Low As Reasonably Achievable (ALARA). The principle that radiation exposures must be reduced to the lowest level that can reasonably be achieved.

CODE:

CPD:
Continuous Professional Development.

CT:
Computerised Tomography.
Creation of transverse tomographic sectional imaging of the body using a rotating fan beam, detector array and computed reconstruction.

CTDI vol:
Computerised Tomography Dose Index Volume.
CTDI vol is a measure of the radiation exposure per slice. CTDI vol is independent of scan length.

DLP:
Dose Length Product:
DLP is measure of total radiation exposure for the whole series of images DLP = CTDI vol x irradiated length. Irradiated length is usually longer than imaged length in helical scanning. DLP is proportional to scan length.

DRL:
Diagnostic Reference Levels.
Dose levels in medical radio-diagnostic practices or, in the case of radio-pharmaceuticals, levels of activity, for typical examinations for groups of standard-sized patients or standard phantoms for broadly defined types of equipment. These levels are expected not to be exceeded for standard procedures when good and normal practice regarding diagnostic and technical performance is applied.

LMP:
Last Menstrual Period.
By convention, pregnancies are dated in weeks starting from the first day of a woman’s last menstrual period (LMP). If her menstrual periods are regular and ovulation occurs on day 14 of her cycle, conception takes place about 2 weeks after her LMP.
Operator:
Radiology technicians, technologists, and sonographers fall within the broad scope of a radiography profession. Radiographers are typically involved in initial patient evaluation and testing, providing diagnostic and evidentiary data for Physicians.

PACS:
Picture Archiving and Communications System:
A network of computers used by radiology departments that replaces film with electronically stored and displayed digital images. It provides archives for storage of multimodality images, integrates images with patient database information, facilitates laser printing of images, and displays both images and patient information at workstations throughout the network. It also allows viewing of images in remote locations.

RIS:
Radiology Information System.
A RIS is a computerised database used by radiology departments to store, manipulate, and distribute patient radiological data and imagery. The system generally consists of patient tracking and scheduling, result reporting and image tracking capabilities. RIS complements Hospital Information Systems (HIS), and is critical to efficient workflow to radiology practices.

Radiation (Ionising):
Radiation that produces ionisation in matter. Examples are alpha, beta, gamma and x-radiation and neutrons. When these radiations pass through the tissues of the body, they have sufficient energy to damage DNA.

Radiation Medical Practitioner:
A radiologist is a physician who reads and interprets digital images, or x-rays, of patients obtained through a variety of cameras, machines, and imaging equipment. The radiologist uses this information to help diagnose the patient and consult with the treating Physician to develop a course of treatment.

RSO:
Radiation Safety Officer
The appointed person to advise AWH Management and Executive on all matters relating to radiation safety with the Organisation. In this case the RSO is the Practice Manager.

Referral or Request Form:
A request for a diagnostic imaging examination or procedure usually requires the completion of a written request or referral form, via which key information is communicated to the imaging facility from the referring Practitioner.
INTRODUCTION:
Standard Operating Procedures (SOPs) are succinct formal documents designed to achieve consistency in specified trial functions by specifying standard practice in performing those functions.

AIM:
This document covers all practical issues required to comply with Code of Practice for Radiation Protection in Medical Applications of Ionizing Radiation 2008.

PURPOSE AND SCOPE:
The purpose of this SOP is to describe the process of radiation for any patient undergoing a CT scan. The SOP will cover:
- Procedure for identification of individuals undergoing a CT medical exposure.
- Procedure for making enquiries of females of childbearing age.
- Procedure for justification / authorisation of a CT medical exposure.
- Procedure for the assessing of the patient radiation dose.
- Procedure for setting and monitoring diagnostic reference levels.
- Procedure for accidental or unintended radiation exposure.
- Procedure for Ensuring that all Operators understand the Principles of Dose Reduction.
- Procedure for the Provision of CT Imaging Protocol and Standard Exposure Factors.
- Systems of Work for CT Operators.

This SOP will be followed by all staff involved in the use of CT equipment. All members of staff who use radiation, or are in any way involved with its use, shall do so only in accordance with State Registrations. Staff who work with radiation shall exercise reasonable care, use any protective equipment provided, report any defect in such equipment, wear any radiation monitors provided and undertake any training deemed necessary.

ROLES AND RESPONSIBILITIES:
Key roles and responsibilities are defined in the Code:
- **The Responsible Person (Management Licence Holder):** the person who has the overall management responsibility of the radiation source or practice.
- **The Medical Radiation Practitioner:** the person responsible for the justification and optimisation of the medical procedure involving the exposure of the patient to ionizing radiation.
- **The Operator:** the person who exposes the patient to ionizing radiation.
PROCEDURE FOR IDENTIFICATION OF INDIVIDUALS UNDERGOING A MEDICAL EXPOSURE:

PURPOSE:
To ensure the correct identification of patients prior to exposure.

SCOPE:
All CT examinations.

RESPONSIBILITIES:
The operator initiating the exposure is responsible for ensuring the final check of patient identity has been made before proceeding. The operator checking patient identity will adhere to this procedure.

PROCEDURE:
- *The operator* must undertake a positive patient identification (PPI) check and therefore they must ask the patient to state their name, address and date of birth. These details must be checked against the request form and if there are any discrepancies these must be investigated before undertaking the examination (refer to Annex 1).
- If *the operator* is satisfied that they have the correct patient they will sign the ‘Time Out’ stamp on the referral. This will be scanned into the patient’s records on Radiology Information System (RIS) for reference.
- For patients unable to communicate through illness, physical or mental disability or language barrier, check identification bracelets or ask an escorting relative, carer or interpreter. A positive identification must be given.
- If there is no escort or identification bracelet on a patient, who is unable to give their details, contact the referring department and ask for someone who can identify that patient, such as a nurse or relative, to visit and identify the patient. The person who checks the patient identity will sign the request form in the “time out” stamp.
- The same identification procedure will be used by *the Operator* immediately prior to an intravenous injection of Contrast Media.
- A history of any previous relevant X-ray investigations should, whenever possible, be taken from the patient prior to carrying out the new procedure to correlate the clinical detail provided on the radiology request form to that patient. The RIS and Picture Archive and Communication System (PACS) should be checked in every patient contact to ensure up to date records and any previous radiology or information.
FLOW CHART FOR THE PROCEDURE OF POSITIVE PATIENT IDENTIFICATION (PPI) UNDERGOING A CT SCAN

1. Medical Imaging with referral and details entered / confirmed onto RIS

2. Patient enters CT Room
   - Positive Patient Identification (PPI) performed

   - PPI criteria satisfied
     - PPI ‘Time Out’ documentation performed
       - Examination undertaken subject to justification
   - PPI criteria NOT satisfied
     - Additional information required from alternate source
       - PPI criteria NOT satisfied
         - Examination not performed

   - PPI criteria NOT satisfied
     - Examination not performed
PROCEDURE FOR MAKING ENQUIRIES OF FEMALES OF CHILDBEARING AGE:

PURPOSE:
To prevent unnecessary irradiation of a foetus from a medical exposure by ensuring enquiries with regard to pregnancy are made in an appropriate and consistent manner.

SCOPE:
All women of childbearing age who are to undergo CT examinations.

RESPONSIBILITY:
The operator initiating the exposure is responsible for ensuring the final check of pregnancy has been made before proceeding. The operator checking pregnancy will adhere to this procedure (Refer to Annex 2).

PROCEDURE:
- The operator will require the outpatients to complete and sign the Pregnancy Questionnaire that will include questions on pregnancy and LMP (Refer to Outpatient Pregnancy Questionnaire (Females Aged 12 - 55 Years) Radiation Form). For inpatients, the requesting doctor will complete a pregnancy information section as part of the CT Contrast Consent Form (Refer to Medical Imaging Inpatient Referral Form).
- If the patient states that she is NOT pregnant following choosing one of the reasons in the table below then proceed with the exposure. The patient should sign the Pregnancy Questionnaire and this needs to be scanned into the patient’s file on the RIS.

<table>
<thead>
<tr>
<th>Do you meet one of the following criteria? It is not necessary to say which one:</th>
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<tr>
<td>- Not sexually active</td>
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<tr>
<td>- Tubal Ligation</td>
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<tr>
<td>- Hysterectomy</td>
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<td>- Post-Menopausal</td>
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<td>- Partner has had a vasectomy</td>
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<tr>
<td>- Negative Pregnancy Test (BHCG)</td>
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<tr>
<td>- Currently Menstruating</td>
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<td>- Mirena / Implanon</td>
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- If the patient states that she IS pregnant:
  - Consult with the Radiation Medical Practitioner to check if the procedure may be safely deferred. The Radiation Medical Practitioner may contact the referrer directly or delegate the task to the operator.
  - If the procedure cannot be deferred justification can only be approved by the Radiation Medical Practitioner. If the outcome of the decision is that the procedure is justified and must proceed due to its nature, then Radiation in Pregnancy Consent Form (Refer to Radiation in Pregnancy Consent Form) should be administered by the Radiation Medical Practitioner. Risks vs benefits should be concisely explained to the pregnant patient.
- If the patient states that she CANNOT EXCLUDE PREGNANCY: Review her given date of LMP.
  - If the LMP date is within 10 days of the proposed examination date, proceed with the examination.
If the LMP date is over 10 days consult with the Radiation Medical Practitioner to check if the procedure may be safely deferred. If the procedure **cannot** be deferred a pregnancy test must be arranged. If the pregnancy test is **negative** proceed with the exposure. If pregnancy test is **positive** the examination must not proceed until justification is provided by the Radiation Medical Practitioner.

- For patients unable to communicate through illness, physical or mental disability or language barrier, all questions relating to pregnancy will be addressed to an escorting relative, carer or interpreter.
Female Patient of Childbearing Age (12-55 yrs)

Pregnancy status questionnaire. Is the patient pregnant?

No (Criteria satisfied)
- Proceed (Status documented)

Unsure
- Consult with Radiation Medical Practitioner

Yes
- Pelvis
- Consult with Radiation Medical Practitioner

Area of examination

Area other than pelvis
- Proceed with lead shielding

Pelvis
- Non Urgent
- Consult with Radiation Medical Practitioner

Follow 10 Day Rule

> 10 days from LMP
- Rebook when status verified

< 10 Days from LMP
- Pregnancy test to be organised

Do you meet one of the following criteria?
It is not necessary to say which one:
- Not sexually active
- Tubal Ligation
- Hysterectomy
- Post-Menopausal
- Partner has had a vasectomy
- Negative Pregnancy Test (BHCG)
- Currently Menstruating
- Mirena / Implanon
PURPOSE:
The Department of Health Victoria requires every medical exposure to be justified and authorised in advance, in accordance with clause 3.3.3 of the Code. This procedure states how that justification takes place and how the operators conducting a medical exposure are made aware of the fact that justification has occurred.

SCOPE:
All CT examinations.

RESPONSIBILITY:
It is the responsibility of the Radiation Medical Practitioner to authorise each exposure (generically or individually) only if it is justified. It is the responsibility of the operator to effect a medical exposure only once authorisation has been obtained.

PROCEDURE:
- Radiation Medical Practitioners are entitled to provide generic justification protocols or individual justification for CT examinations. When justifying a medical exposure, consideration should be given to the following points:
  - The objectives of the exposure.
  - The direct health benefit to the individual.
  - The individual detriment the exposure may cause.
  - The benefits and risks of alternative techniques which may meet the objectives with less or no detriment.
- The following matters will demand special attention:
  - Exposures on medico-legal grounds.
  - Exposures with no direct health benefit to the individual being exposed.
  - Exposure of females who are, or may be pregnant.
  - Urgent / out of hour’s exposures.
  - Children.
- If sufficient clinical information is not made available by the referrer the Radiology Request Form will be returned in the cases of non-urgent referrals. In the case of urgent referrals the Radiation Medical Practitioner will arrange for the referrer to be contacted to obtain the relevant information. The Radiation Medical Practitioner will arrange for the non-urgent Radiology Request Forms to be returned with a tick chart (Refer to Incomplete Imaging Request Return Form) identifying additional information required attached.
- The examination must not proceed until the operator has either: (Refer to Annex 3)
  - Determined that the examination is generically justified as per the specific protocol OR
  - Had the examination justified individually and set a specific protocol by the Radiation Medical Practitioner.
  - In both cases there must be documented evidence i.e. signature of the individual who has deemed the examination justified. This is then to be scanned into the patient’s file on the RIS (Refer to Outpatient Consent Form for the Administration of Contrast).
• The Operator is entitled to refer the process to justification on an individual basis by the Radiation Medical Practitioner at any time.

• All CT scans on either paediatric or pregnant patients MUST be justified on an individual basis. Generic justifications DO NOT apply.

• All CT scans that DO NOT have generic justifications must be justified on an individual basis. These examinations include: CT Angiograms (CT Pulmonary Angiogram and CT Coronary Angiogram excluded) OR scan with multiple phases.
JUSTIFICATION AND APPROVAL FLOW CHART

Medical Practitioner

Referral received from Medical Practitioner

Justification and Approval Flow Chart

Generic Justification
Assessment performed by Operator in accordance with established protocol

Insufficient clinical notes
Justified
Outside the scope of generic justification

Justification on an individual basis
Assessment performed by the Radiation Medical Practitioner in accordance with requirements of section 3.2 of the Code

Justified
Insufficient Clinical Notes
Cannot be justified

Approval
Performed by Operator in accordance with guidelines established by the Radiation Medical Practitioner

Not Approved
Operator requests justification on individual basis

Approval
Performed by the Radiation Medical Practitioner in accordance with Section 3.2 of the Code

Examination Proceeds
Justification documented in patient’s file on RIS

ALL PAEDIATRIC OR PREGNANT PATIENTS REQUIRE JUSTIFICATION ON AN INDIVIDUAL BASIS
PROCEDURE FOR REVIEW OF JUSTIFICATION PROTOCOLS:

PURPOSE:
The Department of Health Victoria requires every medical exposure to be justified and authorised in advance, in accordance with clause 3.3.3 of the Code. This procedure states the process for review of generic justification protocols.

SCOPE:
All generic justification protocols for CT.

RESPONSIBILITY:
It is the responsibility of the Radiation Medical Practitioner in conjunction with the CT Team Leader to ensure that all generic justification protocols are reviewed regularly.

PROCEDURE:
- The generic justification protocols should be reviewed by the Radiation Medical Practitioner every 12 months.
- The generic justification protocols should be reviewed on the installation of new CT software or equipment.
- The generic justification protocols should be reviewed by request of the Radiation Medical Practitioner at all other times.
PROCEDURE FOR THE ASSESSMENT OF THE PATIENT DOSE:

PURPOSE:
To detail how patient dose indicators are recorded for each medical exposure.

SCOPE:
Covers all CT examinations.

RESPONSIBILITY:
It is the responsibility of the operator who initiates the exposure to ensure that the appropriate patient dose indicator is recorded. This information is automatically attached to the patient's scan as JPEG image.

PROCEDURE:
- The CT scanner will automatically record the CTDIvol and Dose Length Product (DLP) for the examination in the patient's examination record which is stored and available of PACS.
- Dose Reference Levels (DRL) Alerts as specified by Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) are in place on the CT scanner. As a result any scan that exceeds the ARPANSA DRL provides an alert. The scan can either be adjusted to reduce the dose OR a reason is required to be recorded. Examples include large patient, multiple series required or allow the operator to add individual reasons.
PROCEDURE FOR SETTING AND MONITORING DIAGNOSTIC REFERENCE LEVELS (DRL):

PURPOSE:
To set and review Diagnostic Reference Levels (DRLs) and to take corrective action and review levels when consistently exceeded.

SCOPE:
Comparison of CT examinations with nationally established DRLs.

RESPONSIBILITY:
The CT Team Leader will investigate excessive doses and implement corrective action.

PROCEDURE:
- At least every six months the CT Team Leader will perform a patient dose audit, set DRLs and provide a report to the RSO.
- The CT Team Leader will ensure the list of DRLs (from ARPANSA) is displayed in the CT scanner control room.
- For each examination the operator initiating the exposure will compare the dose indicator with the relevant DRL.
- The operator initiating the exposure will record a reason of any dose indicator exceeding the relevant DRL.
- The CT Team Leader together with the RSO will review the results at regular intervals and establish where DRLs are being consistently exceeded.
- The CT Team Leader will investigate excessive doses and implement corrective action.
PROCEDURE FOR ACCIDENTAL OR UNINTENDED RADIATION EXPOSURE:

PURPOSE:
To ensure that all accidental and unintended exposures to patients or participants are properly investigated and recorded.
To ensure that reportable incidents are reported to the appropriate authority.

SCOPE:
Covers all CT examinations.

PROCEDURE:
- Any member of staff who suspects that an accidental, unnecessary or unintended exposure has occurred will, as soon as possible, record relevant information and report full details of the incident to the RSO and record the incident on VHIMS. The RSO will arrange for an investigation to be carried out immediately as per the Radiation Management Plan.
- Patients who undergo a procedure that was not intended, as a result of mistaken identification or other procedural failure, and consequently have been exposed to an ionising radiation dose, must be considered as having received an unintended dose of radiation.
- If the person reporting the incident has reason to believe it was caused by a radiation equipment fault, that person will advise other staff not to use the suspect equipment until it has been checked. The RSO will arrange for an assessment of the equipment to be made and will not allow it to be used for medical exposures until it is demonstrated that its performance is reliable and within recommended QA standards.
PROCEDURE FOR ENSURING THAT ALL OPERATORS UNDERSTAND THE PRINCIPLES OF DOSE REDUCTION:

PURPOSE:
This is to ensure Radiation Dose should be managed and minimized following As Low As Reasonably Achievable (ALARA) principle.

SCOPE:
All staff using the CT scanner should follow to procedure to reduced radiation exposure.

PROCEDURE:
- Departmental staff meetings, during which radiation protection information is disseminated, are held regularly and minuted. These meetings include Practice Manager Meetings, Directorate Meetings and general staff meetings.
- The identity of the patient is checked prior to any radiation exposure.
- All equipment is subject to regular preventative maintenance and independent radiation safety and performance assessment.
- CT equipment faults are logged and reported to the CT Team Leader and the RSO.
- All staff receive appropriate in-house training on the operation of equipment.
- All untoward incidents are reported to the RSO and logged on VHIMS.
- All radiation incidents are reported and investigated.
- The cause of radiation incidents are reviewed and appropriate action taken to minimise the risk of recurrence.
- Care is taken at all times whilst examining patients to select the most appropriate examination settings and operate it in accordance with manufacturer’s instructions and operate in accordance with manufacturer’s guidelines.
PROCEDURE FOR THE PROVISION OF CT IMAGING PROTOCOL AND STANDARD EXPOSURE FACTORS:

PURPOSE:
To identify the procedure for the provision of imaging protocols (standard image sequences) and the setting of standard exposure factors.

SCOPE:
All CT examinations.

PROCEDURE:
- Standard imaging protocols are agreed by the Radiation Medical Practitioner and documented by the CT Team Leader. No alterations can be made to these protocols without consent of the Radiation Medical Practitioner.
- Standard exposure factors for each type of CT examination are stored within the scanner’s anatomical programme lists on the CT scanner.
- Any adjustment to the programmed exposure factors must be authorised by the CT Team Leader.
SYSTEMS OF WORK FOR CT OPERATORS:

- Only AHPRA registered staff trained to operate the CT scanner are permitted to do so.
- Do not enter the CT Scanning room if the xray warning light is illuminated.
- External door should be locked whilst CT Scanning is in progress.
- All doors must be closed during scanning.
- All exposure parameters are to be checked prior to scanning.
- During tube ‘warm up’ the Console desk must be attended to ensure that the room is not entered.
- Remote injector must be used wherever possible.
- CT Operator must not leave the scan console during scanning.
Annexes:

Related AWH Documents:

Accreditation Standards:

Other Relevant Information:

References:

Contact Point: Medical Imaging.

In consultation with:

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<td>Responsible Department:</td>
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<tr>
<td>Medical Imaging</td>
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