Standards of Practice for Interventional Radiology and Interventional Neuroradiology

The Royal Australian and New Zealand College of Radiologists®

The Faculty of Clinical Radiology

Standards of Practice for Interventional Radiology and Interventional Neuroradiology

Clinical Radiology

Standards

Name of document and version:
Standards of Practice for Interventional Radiology and Interventional Neuroradiology, Version 1.0

Approved by:
Faculty of Clinical Radiology Council

Date of approval:
10 June 2022

ABN 37 000 029 863

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TABLE OF CONTENTS

About RANZCR

The Royal Australian and New Zealand College of Radiologists (RANZCR) is committed to improving health outcomes for all, by educating and supporting clinical radiologists and radiation oncologists. RANZCR is dedicated to setting standards, professional training, assessment and accreditation, and advocating access to quality care in both professions to create healthier communities.

RANZCR creates a positive impact by driving change, focusing on the professional development of its members, and advancing best practice health policy and advocacy, to enable better patient outcomes. RANZCR members are critical to health services: radiation oncology is a vital component in the treatment of cancer; clinical radiology is central to the diagnosis and treatment of disease and injury.

RANZCR is led by clinicians who are democratically elected by the membership. The ultimate oversight and responsibility for RANZCR is vested in the Board of Directors. The work of the RANZCR is scrutinised and externally accredited against industry standard by the Australian Medical Council and the Medical Council of New Zealand.

Our Vision

RANZCR as the peak group driving best practice in clinical radiology and radiation oncology for the benefit of our patients.

Our Mission

To drive the appropriate, proper and safe use of radiological and radiation oncological medical services for optimum health outcomes by leading, training and sustaining our professionals.

Our Values

Commitment to Best Practice

Exemplified through an evidence-based culture, a focus on patient outcomes and equity of access to high-quality care; an attitude of compassion and empathy.

Acting with Integrity

Exemplified through an ethical approach: doing what is right, not what is expedient; a forward-thinking and collaborative attitude, and patient-centric focus.

Accountability

Exemplified through strong leadership that is accountable to members; patient engagement at professional and organisational levels.

Leadership

Exemplified through a culture of leadership where we demonstrate outcomes.

Code of Ethics

The Code defines the values and principles that underpin the best practice of clinical radiology and radiation oncology, and makes explicit the standards of ethical conduct the College expects of its members.

INTRODUCTION

Purpose and scope

(a) This Standards of Practice for Interventional Radiology and Interventional Neuroradiology document is intended to assist The Royal Australian and New Zealand College of Radiologists® (the College; ABN 37 000 029 863), its staff, Fellows, Members and other individuals by specifying standards for the safe and effective preparation, delivery and follow-up of safe and effective interventional radiology and interventional neuroradiology procedures. It sets out the Standards of Practice that are required to safeguard patient safety and maintain good clinical practice to ensure patients receive optimum care from providers of interventional radiology and interventional neuroradiology services.

(b) This document establishes a quality framework for interventional radiologists, interventional neuroradiologists, hospital departments and specialist clinics to support the delivery of high-quality patient care and outcomes. It may also be used to assess wider health system measures, such as quality of life, cost-effectiveness and cost-benefit comparisons. This document does not address clinical outcomes of specific procedures directly; although these are critically important to high-quality clinical practice, they will be dependent on the condition of each patient and may differ between individual cases.

The Standards of Practice for Interventional Radiology and Interventional Neuroradiology support the recognition of interventional radiology and interventional neuroradiology as clinical specialties of radiology. Interventional radiology and interventional neuroradiology specialisation comprise the full range of image-guided interventions. Recognised subspecialty areas of interventional radiology practice include interventional oncology, peripheral vascular interventions and paediatric interventional radiology.

Interventional radiology and interventional neuroradiology have expanded dramatically over the past few decades, and play an ever-increasing and important role in the diagnosis and treatment of patients. Specialist interventional radiologists and interventional neuroradiologists perform minimally invasive diagnostic and treatment procedures that contribute to safe and effective clinical management of patients.

High-quality interventional radiology and interventional neuroradiology services require data collection to assess the effectiveness and safety of procedures, necessary skills, appropriate support, and adequate facilities. The experience, safety and well-being of patients must be integral to the design of the patient pathway, and must facilitate best medical practice.

The Standards of Practice for Interventional Radiology and Interventional Neuroradiology are made freely available by The Royal Australian and New Zealand College of Radiologists, and are applicable to all interventional radiology and interventional neuroradiology services across Australia and New Zealand.

Background

The RANZCR Standards of Practice for Interventional Radiology (IR) and Interventional Neuroradiology (INR) is the first version, with the previous iteration of the Interventional Radiology Standards having been a subsection of the comprehensive RANZCR Standards of Practice for Clinical Radiology[1], that apply more broadly to both diagnostic and interventional practice.

With the release of Version 11.3 of the RANZCR Standards of Practice for Clinical Radiology, the section relating to interventional radiology (previously Chapter 13) has been replaced by this document, incorporating standards particular to **specialist interventional radiology and specialist interventional neuroradiology** practice**.**

It should be noted that the RANZCR Standards of Practice for Clinical Radiology define Standards that apply to all radiological practice in Australia and New Zealand. The current Standards of Practice for IR and INR are an adjunct to the RANZCR Standards of Practice for Clinical Radiology, and provide additional specific guidance for the professional practice of interventional radiology and interventional neuroradiology. The Standards of Practice for Clinical Radiology apply to all aspects of interventional practice referred to in this document, as they do to diagnostic clinical radiology.

Government Regulation

All medical imaging centres are responsible for maintaining compliance with all relevant jurisdictional legislation (e.g. the Diagnostic Imaging Accreditation Scheme and other National, State or Territory regulations). Legislative requirements may take precedence over some Standards detailed in this document (e.g. retention times for patient records). References to legislation made in this document are not intended to be exhaustive. Practices should meet relevant National, State or Territory and local regulations governing Work Health and Safety, discrimination, building, disabled access, equal opportunity of employment, and utilities (water, gas and electricity).

The Standards of Practice Framework

The Standards of Practice are inter-related and must be considered as a whole. Each Standard is structured as follows:

- The **Standard** refers to a corresponding goal or outcome.
- The **Requirement** refers to the items required to attain the goal or outcome.
- The **Evidence** lists examples of documents or records that the facility and provider should be able to provide as evidence to demonstrate compliance with the Standards, and may be required for future audit or accreditation purposes. Note: this is not an exhaustive list.

Reference materials included within the Standards of Practice for Interventional Radiology and Interventional Neuroradiology are:

- A glossary of definitions explaining the meaning of technical terms, in alphabetical order.
- A reference list.

Feedback

RANZCR seeks ongoing feedback and welcomes suggestions for improvement in the Standards. All feedback should be forwarded to standards@ranzcr.edu.au

STANDARD ONE: GOVERNANCE

A governance framework ensures there is a systematic approach to ensuring structures, systems and processes are in place that effect change to improve the management of operation and delivery of services resulting in safe, effective and high-quality patient care.[2]

Standards

S1.1 The provider has an appropriate governance framework for the leadership and management of the interventional radiology and interventional neuroradiology facility, including delivery of its services and in supporting safe practice, and quality improvement and innovation[3].

S1.2 Systems are in place to monitor and evaluate the quality of care provided and patient outcomes.

S1.3 Patient outcomes are compared to national and international benchmarks for best practice, and areas of quality improvement for patient care are identified.

Requirements

R1.1 The provider's leadership and management team cultivate an inclusive and just culture.

R1.2 The management structure must adapt as the provider's service capabilities and requirements evolve.

R1.3 The provider must have a strategic plan to guide decision-making and determine the allocation of resources to pursue its strategy.

R1.4 The strategic plan must be developed with due consideration of:

(a) Current standards
(b) Existing national benchmarks for access to interventional radiology and interventional neuroradiology
(c) Predicted population changes
(d) Physical infrastructure, equipment and its future development, and staffing requirements
(e) Multidisciplinary support services
(f) Broader organisational planning, where applicable
(g) Timelines for review and revision.

R1.5 The provider must have an operational implementation plan, which includes:

(a) Set goals and mapped out activities within a reasonable timeframe
(b) A clear and comprehensive budget where applicable
(c) Specific and measurable targets that show progress and will inform future planning.

R1.6 The provider must have processes for managing types of risks that could affect the service, which includes:

(a) Operational, compliance, financial and reputational risks
(b) Clinical risks. Information from clinical incidents, workplace health and safety incidents, and near misses provides a valuable opportunity to improve patient safety and outcomes. Promoting open reporting, and providing feedback to staff on incident data and investigations are vital components of a successful risk management system.

R1.7 Systems are in place to monitor and evaluate the quality of care provided and patient outcomes.

R1.8 An appropriate committee, management or review structure is in place to monitor the quality of healthcare delivered by the facility. This includes the review of clinical incident data, staff and consumer feedback, and internal and external audit and performance data.

R1.9 The facility should conduct regular peer review meetings at which interventional radiologists and interventional neuroradiologists are required to participate.

R1.10 Morbidity and mortality outcomes should be discussed in peer review meetings, and appropriate action plans are developed to address any recommendations.

R1.11 Regular audits of data collected should be conducted, including comparison to recognised standards and benchmarks to inform improvements in safety and quality of care provided.

R1.12 The facility should encourage interventional radiologists and interventional neuroradiologists to conduct personal audits of practice by sharing templates and promoting an identified positive change to improve patient outcomes.

R1.13 The facility should request feedback from patients, carers and consumers, and has processes for reviewing feedback and actioning when required.

R1.14 Patient outcomes are compared to national and international benchmarks for best practice, and areas of quality improvement for patient care are identified.

R1.15 All participation in clinical research is consistent with the *National Health and Medical Research Council Act 1992* (Cwlth) and the *Guideline for Good Clinical Practice*[4].

Examples of evidence

(a) Documented current plans (strategic and operational, or business) covering a timeframe of 2 to 5 years that identifies the ongoing and development needs of the facility to maintain or improve the service provided that is endorsed by the delegated representative.
(b) Evidence of meetings involving relevant personnel to review performance and manage operational risks and safety issues. Maintaining a comprehensive, accurate and current risk register.
(c) Regular audit of infection control practices, including the availability of necessary personal protective equipment.
(d) Documented approach for the adoption of new and novel technologies and procedures.
(e) Evidence of a structure in place to monitor and review service delivery and facility performance.
(f) List of peer review meetings held and accompanying attendance lists.
(g) Minutes or record of peer review meetings, including any recommendations and resulting action.
(h) A documented record of cases discussed by interventional radiologists and interventional neuroradiologists at regular morbidity and mortality meetings in line with local practice requirements.
(i) Review of unit outcomes and trends, with comparisons against standards of practice documents and/or data from other relevant units (where available).
(j) Review of procedural complications over the previous 12 months and lessons learned.
(k) Patient experience survey, collation of results and any action resulting from feedback.
(l) List of research projects and records of relevant regulatory, internal organisational and ethics approval for all clinical research activities.

STANDARD TWO: FACILITY INFRASTRUCTURE AND ENVIRONMENT

The life-cycle management of buildings, plant, equipment and systems supports safe and effective service delivery that promotes patient-centred care.

Standards

S2.1 The physical facility infrastructure and environment, including patient, staff and public amenities, is designed, managed and maintained to support the safe and effective delivery of interventional radiology and interventional neuroradiology services.

S2.2 The facility has access to accredited hospital and ambulatory clinical services to deliver patient-centred care in line with relevant service level agreements.

Requirements

R2.1 Input from interventional radiologists and interventional neuroradiologists must be sought in the planning and design of facilities, to support effective patient care pathways.

R2.2 Room design and radiation shielding should provide flexibility to allow for future changes or new technologies.

R2.3 The physical infrastructure and environment must facilitate the delivery of interventional radiology and interventional neuroradiology services within clinically relevant timeframes, and ensure consistent high-quality service delivery.

R2.4 The facility environment must ensure that patient dignity, privacy and confidentiality can be maintained, e.g., available private spaces, use of curtains.

R2.5 The facility environment should ensure that individual patient needs, including ethnic, cultural, and religious practices and beliefs, are met and respected at all times, e.g., private room allows for discussion with family or significant others.

R2.6 Facilities should grant admitting rights to interventional radiologists and interventional neuroradiologists with access to junior medical officers to enable them to provide appropriate specialist medical, periprocedural and ambulatory care. Admitting rights should be available in both public and private institutions.

R2.7 Patients undergoing complex interventional radiology and interventional neuroradiology procedures must have access to anaesthesia services,[5] high-dependency or intensive care bed access and diagnostic radiology when required, with available emergency management processes and procedures appropriate to the level of complexity of the procedure. There should be prompt access to surgical, interventional and medical management of complications.

R2.8 The procurement, storage and use of devices, drugs, consumables and materials must be planned and managed effectively, so they are fit for use when required.

R2.9 Interventional radiologists and interventional neuroradiologists have proportionate access to hospital hybrid operating suites when required.

R2.10 Centres that have emergency, trauma and perioperative capability shall have prompt access to a suitable interventional radiology angiography suite and/or hybrid operating room where appropriate.

Additionally, for interventional neuroradiology:

R2.11 Comprehensive stroke centres have onsite access to stroke beds, stroke physicians, intensive care unit, diagnostic radiology/neuroradiology, neurosurgery and anaesthesia services to provide a multidisciplinary approach to managing acute stroke patients and shall have prompt access to a suitable biplane angiography suite.[6]

Examples of evidence

(a) A documented current business or operational plan (2–5 years) that identifies the ongoing development and maintenance needs of the facility.
(b) Evidence that the current plan (if less than 12 months, also the immediate previous plan) is/has been followed and the required action taken.
(c) Facility and environment inspection confirms requirements.
(d) Admitting rights for accredited interventional radiologists and interventional neuroradiologists practising within the relevant facility, as per their scope of clinical practice.
(e) Patient records show timely access to required supporting clinical and multidisciplinary services.
(f) Relevant meeting minutes demonstrate prompt action in response to ensuring better accessibility or availability of supporting clinical and multidisciplinary services in the event of any identified issues.
(g) Documented arrangements for the procurement, storage and management of usable and non-reusable devices, consumables, drugs and materials.

STANDARD THREE: FACILITY MEDICAL DEVICES AND EQUIPMENT

The selection, provision and maintenance of technologically appropriate medical devices and equipment will ensure accurate and safe clinical treatment.

Standards

S3.1 Provision of technologically appropriate equipment allows for successful completion of procedures to the highest standard, in the shortest timeframe and with the fewest complications when the equipment is operated by appropriately trained personnel.

S3.2 Requirements for new IR and INR equipment are specified by qualified, trained and appropriately experienced staff.

S3.3 Specifications for IR and INR equipment used predominately for IR and INR procedures are determined by the interventional radiologist and interventional neuroradiologist, respectively.

S3.4 All equipment is installed, updated or modified, acceptance tested, commissioned and used by appropriate personnel.

S3.5 All IR and INR equipment is preventatively maintained and quality checked to ensure its safety, reliability, reproducibility and accuracy.

Requirements

R3.1 Specifications for equipment purchase must:

(a) Be based on a detailed statement of clinical and technical requirements
(b) Take relevant standards into account
(c) Include the provision of appropriate user training and maintenance by the manufacturer, vendor or other suppliers
(d) Take into account specialist technical advice of what aspects of equipment are essential
(e) Be written in conjunction with the multidisciplinary team, involving specialist advice.

R3.2 Medical physicists, or appropriately qualified experts, shall take responsibility for acceptance testing and the commissioning programme.

R3.3 The commissioning programme must clearly define:

(a) Any baseline values for quality assurance and system operation
(b) The scope of tests to be performed with respect to intended clinical use
(c) The staff groups to be involved
(d) The risk assessment for component or system failure.

R3.4 The provider must maintain an equipment inventory, including consumables in adequate volumes to provide the appropriate services.

R3.5 A preventative maintenance programme must be established for equipment, following the manufacturers' recommendations. Any variations must be documented, including the explanation.

R3.6 Any communication from the manufacturer in relation to safety and operating functionality must be retained with maintenance records and disseminated as appropriate within the facility.

R3.7 Medical physicists, or appropriately qualified experts, must be responsible for authorising the return of equipment to clinical use following any repair, adjustment, upgrade or modification to the equipment that affects patient safety. This may include carrying out acceptance tests.

R3.8 A quality assurance programme must be established for the testing of interventional radiology and interventional neuroradiology equipment to make sure equipment is working to the required specifications. As a minimum, checks of equipment must take place as part of annual equipment maintenance.

R3.9 All maintenance and testing records must be kept for at least the lifetime of the equipment.

R3.10 The maintenance and quality testing of equipment is overseen by the provider.

R3.11 Suitable facilities and equipment must be available when administering sedation and/or analgesia for interventional procedures.[5]

Additionally, for interventional neuroradiology:

R3.12 Interventional neuroradiology services offering a 24/7 mechanical thrombectomy service must have continuous access to an interventional angiography suite with biplanar angiographic capability.

R3.13 Angiography suites should contain a biplane angiographic unit with flat-panel CT capabilities to perform high-quality cerebral angiography.

Examples of evidence

(a) Evidence of interventional radiologist or interventional neuroradiologist involvement in approving the specification of interventional radiology or interventional neuroradiology equipment.
(b) A comprehensive equipment inventory and stock management system.
(c) Evidence of acceptance testing and commissioning for all IR and INR equipment.
(d) Maintenance programme details and records for all significant items of reusable medical equipment.
(e) A documented quality assurance programme for IR and INR equipment that includes, as relevant:
    a. a systematic approach for all equipment tests, specifying their frequency tolerances, recording requirements and personnel responsible
    b. a documented audit plan and programme
    c. records for every test undertaken
    d. a protocol for managing test failures and non-compliances that includes action levels, reporting requirements and action to be taken.
(f) Records of delays, unscheduled breaks in treatment and remedial action taken due to equipment failure.
(g) Maintenance programme details and records for all significant items of reusable medical equipment.
(h) Evidence of compliance with *PG09: Guideline on sedation and/or analgesia for diagnostic and interventional medical, dental or surgical procedures*[5] and *PG29: Guideline for the provision of anaesthesia care to children.*[7]

STANDARD FOUR: PROVIDER WORKFORCE PROFILE

Ensure there is a good standard of care and experience for patients. Patient safety and good patient outcomes are inseparable from a culture that values and supports highly qualified and competent staff. Providers must ensure that staff are enabled and encouraged to continue and maintain their skills through lifelong learning and reflective practice.

Standards

S4.1 The number of staff employed, with consideration of staff experience and the variety of job roles they fulfil, is adequate to ensure consistent delivery of safe and effective care for the planned patient load both in-hours and after-hours.

S4.2 Staffing schedules adequately incorporate enough time for staff to engage in all relevant clinical and non-clinical activities, within usual rostered hours.

S4.3 All staff[i] employed to work in IR and INR have dedicated interventional radiology / interventional neuroradiology training and are competent to perform or assist with the procedures performed at the facility.

S4.4 The provider ensures the maintenance of staff competence by regular performance review, and actively supports staff by promoting continuing professional development.

Requirements

R4.1 The provider must employ suitable staff in leadership and management roles to organise staff schedules and effectively plan service delivery.

R4.2 The provider must employ an adequate number of clinical and support staff (medical radiation practitioners/sonographers, junior medical staff, nurses), with requisite experience and skills, to provide safe and effective care to patients.

R4.3 The provider must have policies and processes in place to ensure that specialist IRs and INRs are selected against criteria that are commensurate with the level of specialist procedures required in the role.

R4.4 The provider must have effective recruitment and selection processes that ensure staff employed have the relevant qualifications and training to fulfil their role.

R4.5 The provider must keep a register of the staff registration status, licence to practice, certification of staff and the completion of any requirements of their professional body to maintain competence.

R4.6 Clinical teams involved in performing IR and INR procedures must include the interventional radiologist or interventional neuroradiologist, scrub nurse, scout nurse and a medical radiation practitioner/sonographer, as required. If deep sedation or general anaesthesia is required, an anaesthetist, anaesthetic trained nurse and recovery staff should be available.[8]

R4.7 Staff must be employed and remunerated in accordance and within award agreements, relevant jurisdictional regulatory requirements and national codes of practice.

R4.8 Staff[ii] training must be supervised appropriately in accordance with RANZCR accreditation standards.

[i]Staff in this instance refers to medical, nursing, radiography, sonography, other technical and administrative support staff.
[ii]Staff in this instance refers to pre-fellowship trainees and post-fellowship trainees.

R4.9 Staff[iii] schedules must take into account time allowances, such as:[9,10,11]

(a) Initial patient consultations
(b) Pre-procedural consultations
(c) Interaction with referrers
(d) Participation in multidisciplinary team discussions and treatment planning
(e) Review of admitted patients
(f) Management of complications and follow-up
(g) Post-procedure care, including ward rounds
(h) Attendance to outpatient clinics or consultations
(i) Teaching and education
(j) Research and development
(k) General administration
(l) Record keeping
(m) Contributing to quality assurance, safety and audit activities.

R4.10 The provider must support staff who are involved in teaching, and education or research and development as part of their position description, by allocating rostered time for the completion of such tasks.

R4.11 The provider must facilitate staff to take normal leave to maintain a healthy work environment, and minimise the effect of excessive fatigue and workload from usual duties and on-call work.

R4.12 The provider must consider the volume and breadth of procedures undertaken at the facility, and ensure that it is adequate to maintain the individual and organisational competence of staff across the spectrum of interventional radiology and interventional neuroradiology procedures. Where the caseload or mix is inadequate, action must be taken accordingly to enable staff to maintain competence.

R4.13 The provider must have a comprehensive induction that is tailored to the roles within the facility that administer and deliver IR and INR services. The induction must clearly set out:

(a) Duties and supervision
(b) The role in the team
(c) Key workplace policies that must be followed
(d) Accessing key lifesaving equipment
(e) Training on equipment.

R4.14 The provider must have performance review systems in place to assess the competence of individual staff at least annually. Such systems should include peer review, clinical supervision and audit of personal practice.

R4.15 All staff employed to work in IR and INR maintain appropriate IR-/INR-specific continuing education and development according to their area of practice.

R4.16 The provider should support the professional development of staff and quality improvement by allowing leave to attend relevant training and/or assisting with associated costs.

Additionally, for interventional neuroradiology:

R4.17 Specialist interventional neuroradiologists are encouraged to have met maintenance requirements equivalent to the Conjoint Committee for Recognition of Training for Interventional Neuroradiology guidelines.

OR

[iii]Staff in this instance refers to medical, nursing, radiography, sonography, and other technical and administrative support staff.

Medical specialists employed by providers (that are two hours from a networked centre) that offer percutaneous stroke intervention must have met the requirements for appropriate training and experience, as detailed in the RANZCR Framework for Recognition of Training in Percutaneous Stroke Intervention.[12]

Additionally, for interventional radiology:

R4.18 Specialist interventional radiologists will have completed advanced training in Interventional Radiology, and are encouraged to have completed the requirements of the Diploma of the European Board of Interventional Radiology (EBIR), or equivalent.

Examples of evidence

(a) Organisational chart appropriate to the size and extent of services offered with evidence of change when required.
(b) Position descriptions of the management team collectively show responsibility and accountability for all aspects of the service.
(c) The provider has a documented process for the recruitment and selection of new staff.
(d) Position descriptions of staff include required qualifications and responsibilities, and staff are employed on the basis that they meet defined criteria.
(e) A register of staff includes qualifications, registration status, practice licence and continuing professional development obligations to fulfil their role. The register is regularly reviewed and updated to reflect recent education and training. There is a system in place to follow-up staff, if needed.
(f) Records indicate that:
    a. staff are actively engaged in continuing professional development relevant to their position description
    b. leave has been approved for staff to attend relevant professional development
    c. performance review systems have been developed and effectively implemented; i.e., the provider can demonstrate that where performance has been less than satisfactory, action has been taken to ameliorate it.
(g) Records of procedures undertaken at the facility, and the individual staff who performed them, are commensurate with a minimum volume of practice to maintain competence. In the circumstance whereby volume has been low, staff training and/or additional exposure to specific procedures has been sought to rectify the deficiency.
(h) All clinical radiologists performing image-guided procedures should be competent in basic life support, recognition of anaphylactic reactions and aware of emergency management protocols in the event of a medical emergency.
(i) Rosters demonstrate that:
    a. clinical teams include appropriately qualified personnel
    b. appointment and availability of appropriate clinical and non-clinical support staff to assist interventional radiology and interventional neuroradiology clinicians
    c. adequate time is allocated for interventional radiologists and interventional neuroradiologists to conduct ward rounds, clinical consultations and patient reviews
    d. interventional radiologists and interventional neuroradiologists are involved in multidisciplinary meetings and periprocedural care of patients
    e. time is allocated to staff to complete relevant non-clinical activities
    f. appropriate and sustainable shared on-call commitments.
(j) Records demonstrate that:
    a. staff leave is well coordinated, and staff absences do not impact upon the quality of care delivered.
(k) Staff report that:
    a. they can spend the requisite time attending to all patient care needs, within reasonable work hours.
    b. requests for normal leave are usually approved

c. the provider consults with staff to ensure the impact of workloads and work schedules minimise the risk of fatigue from usual duties and on-call work.

(l) Risk management plans document consideration of potential threats to adequate staff levels, and measures that may be taken to ensure patient care and/or staff well-being is not compromised.

STANDARD FIVE: COORDINATED PATIENT CARE

Patients receiving interventional radiology and interventional neuroradiology care enter a health system that ensures consultations are provided in a timely and coordinated manner and clear communication with the patient and the referring practitioner is maintained.

Standard

S5.1 Facility management promotes safe practice, quality improvement and accountability to ensure interventional radiology and interventional neuroradiology care delivery is well coordinated to achieve optimal outcomes for all patients.

Requirements

R5.1 Patient appointments must be coordinated effectively, including pre-procedure consultations for necessary review and work-up prior to anticipated treatment, and post-treatment follow-up and management.

R5.2 The appointment schedule must allow sufficient time for multidisciplinary input to be obtained, and any other imaging or tests to be performed in advance of treatment.

R5.3 Any specific needs for individual patients are identified early, so requirements are available when needed for consultations or when performing a procedure/s.

R5.4 The provider must have sufficient resources to ensure that patients who have been referred to the service are scheduled for care in a timely manner. Any delay/s to treatment, and reason/s for this, are communicated to the patient and recorded in the patient's medical record.

R5.5 Waiting times for treatment are monitored, and if they increase beyond acceptable levels, strategies must be implemented to ameliorate the situation.

R5.6 Patients must be prioritised based on clinical requirements and in accordance with provider policies.

R5.7 Regular communication must be maintained with the referring practitioner throughout the patients' courses of treatment.

Examples of evidence

(a) Appointment schedules indicate adequate time is allocated to pre-procedure consultations.
(b) Records demonstrate that:
    a. patients are receiving coordinated care in clinically appropriate timeframes
    b. letters to referring practitioners are sent for each episode of care in a timely manner.
(c) Staff are aware of processes for identifying any individual patient needs, and there is a system to ensure requirements are available when needed (e.g. Aboriginal liaison officers attending consultations, support equipment).
(d) Evidence of patient cases discussed at Multidisciplinary Meetings.
(e) Evidence that input from an interventional radiologist and interventional neuroradiologist is available for all relevant patient pathways in a clinically acceptable timeframe.
(f) A policy for monitoring and managing waiting times that:
    a. identifies the method used to classify, record and report waiting times
    b. Indicates strategies to be implemented to reduce waiting times, when required.

(g) A policy for prioritising patients for treatment that outlines the basis upon which patients are prioritised.
(h) Data that show trends in waiting times and the effect of any response to significant delays that could impact care.
(i) Contingency plan that guides how to manage any unscheduled interruption to treatment provision.

STANDARD SIX: TREATMENT PLANNING

Patients receiving interventional radiology and interventional neuroradiology care move through a health system that ensures patients are engaged in developing their treatment plans that are informed by consultation and assessments, and tailored to their individual choices and requirements.

Standards

S6.1 Patient pre-treatment assessments and protocols are appropriate for the proposed interventional treatment and adhere to clinical guidelines.

S6.2 Clinicians partner with patients and their carers to facilitate shared decision-making about their care.

Requirements

R6.1 Pre-procedure consultations for advanced interventions must be of adequate duration to ensure thorough patient review, prior to the intended procedure, and allow time for clinicians to explain the treatment plan to patients.

R 6.2 All treatment planned must be in response to patient needs, adhere to relevant clinical guidelines and in accordance with *Choosing Wisely* guidelines.[13,14]

R6.3 Interventional radiologists and interventional neuroradiologists must be able to request imaging and laboratory tests at all points of the patient journey, including planning, treatment and follow-up.

R6.4 Clinicians must engage with patients, and provide detailed information about their condition and treatment options, in a language and format that is understandable for the patient, so that they can make informed decisions about their care.

R6.5 Clinicians must have access to appropriate liaison officers and interpreters to support patients, and ensure cultural safety is maintained during decision-making and the informed consent process.

R6.6 Informed consent is always obtained from the patient, or a person entitled to give consent on behalf of the patient, for the treatment plan, the administration of any sedation or analgesia and performing the procedure.

R6.7 The informed consent process must be conducted by the clinician performing the procedure, or their delegate who has sufficient knowledge of the procedure and its benefits and risks. Patients must be advised about risks that are particularly relevant to them (material risk).

R6.8 Informed consent is obtained in advance of elective procedures, so patients have time to consider the information provided and their decision. Patients are advised of any potential need to change the plan after treatment/the procedure has commenced. Patients are encouraged to take the time they need to decide and discuss their options with family and/or significant others.

R6.9 Consent from the patient is reviewed when there is a delay to the start of treatment, which may impact on the patient's condition or treatment options, or if new information becomes available that may impact upon the patient's prior consent.

R6.10 Treatment plans should be discussed with the patient, ensuring a holistic view is taken. Plans include alterations or additions to medication, pain management, sedation or the need for general anaesthesia, and attend to patient safety before, during and after the procedure.

R6.11 A risk assessment must be conducted before the administration of sedation, analgesia or other pain management in accordance with *PG09: Guideline on sedation and/or analgesia for diagnostic and interventional medical, dental or surgical procedures*[5] and *PG07: Guideline on pre-anaesthesia consultation and patient preparation.*[15]

R6.12 Where identified, cases requiring multidisciplinary review should be discussed in a structured forum that includes relevant multidisciplinary attendance and input, with discussion and outcomes recorded in line with local hospital policies and guidelines.

Examples of evidence

(a) Staff are aware of support available for patients from a variety of cultural backgrounds.
(b) A policy and procedure for obtaining informed consent.
(c) Patient medical records demonstrate that:
    a. thorough pre-procedure consultations are conducted
    b. informed consent process has been conducted by appropriate clinicians, has been obtained in advance for elective procedures, and is documented and reviewed at relevant stages of the patient journey
    c. pre-treatment assessment and protocols are in accordance with clinical guidelines
    d. sedation and/or analgesia risk assessments are conducted, and treatment plans are appropriate to determined risk
    e. multidisciplinary input is sought when necessary, and decisions of multidisciplinary teams are documented and followed.

STANDARD SEVEN: TREATMENT DELIVERY

Patients receiving interventional radiology and interventional neuroradiology care move through a health system that ensures treatment is delivered correctly and safely. Follow-up care is planned, implemented and communicated to the patient and other members of the multidisciplinary team.

Standards

S7.1 Treatment shall be delivered correctly, accurately, safely and consistently with due consideration of each patient's rights and choices.

S7.2 Mechanisms are in place to ensure that patients are safe and as comfortable as possible throughout the duration of treatment.

S7.3 Protocols are in place for appropriate postoperative care to promptly identity and manage complications.

S7.4 Clinical information reporting the outcomes and postoperative care is communicated to patients, referring clinicians and other relevant clinicians, and any subsequent responsibilities are clearly delineated.

Requirements

R7.1 Policies and procedures guide relevant staff on checking and preparing all required IR and INR equipment and accessories prior to each procedure.

R7.2 Prior to the start of any intervention or radiation treatment, the operator verifies that the equipment is working correctly according to manufacturers' instructions and local protocols.

R7.3 Prior to the start of any treatment, required devices, medications and materials must be inspected to ensure that all items are prepared, have not passed their expiry date, and are ready for use. For patients with special needs, ancillary support equipment and trained support personnel must also be available.

R7.4 The facility has procedures to apply patient safety checklists for invasive procedures, as developed by the local jurisdiction, to ensure that the correct procedure is performed on the correct patient and correct site. Clear processes guide staff in circumstances where the patient is not competent to confirm.

R7.5 Appropriate sedation is administered when necessary for patient comfort during a procedure and must be administered by appropriately trained personnel and in accordance with *PG09: Guideline on sedation and/or analgesia for diagnostic and interventional medical, dental or surgical procedures.*[5]

R7.6 Appropriate clinical monitoring equipment must be used for observation of the patient during treatment, and patients are reviewed regularly before, during treatment, immediately after a procedure and during their post-treatment recovery to allow for early detection and management of complications.

R7.7 The facility has documented protocols in place that ensure the rapid transport of patients to an acute care facility when clinically required.

R7.8 The facility has documented protocols that ensure the availability of emergency care/surgical support if required.

R7.9 Patient comfort is assessed continuously throughout the course of treatment, and appropriate analgesia and pain management options are offered.

R7.10 Treatment plans are adapted during delivery with appropriate modification and/or revision as necessary.

R7.11 Clinical follow-up, including imaging follow-up, should be performed in a clinically relevant timeframe, consistent with relevant clinical guidelines.

R7.12 Patients have a personalised follow-up plan that is aligned to agreed local protocols and defined by the procedure performed, and modified to the individual's medical circumstances.

R7.13 Roles and responsibilities for patient follow-up are clear, including responsibilities for liaising with other members of the multidisciplinary team.

R7.14 Patients who may have received a substantial radiation skin dose, as defined by local legislation or guidelines, have a radiation dose assessment completed by a medical physicist, with follow-up, as determined by local protocols.

Additionally, for interventional neuroradiology:

R7.15 In general, interventional neuroradiology procedures are only performed in facilities where neurosurgical support is immediately available on site. Exceptions may include, but are not limited to, head, neck and spinal interventions such as carotid stenting, embolisation of extracranial vascular malformation, and tumour and pain intervention.

Examples of evidence

(a) Staff are familiar with:
    a. procedures to follow prior to the commencement of delivery of treatment
    b. emergency management processes and procedures.
(b) Systematic processes, and relevant support documentation, for checking equipment prior to use and patient verification, such as the use of a patient safety checklist or equivalent.[16, 17]
(c) Documented processes for early recognition and response to clinical deterioration.
(d) Documented processes for rapid transport of patients to acute care facilities when clinically required.
(e) Documented processes that ensure the availability of emergency care/surgical support if required.
(f) Patient medical records demonstrate that:
    a. patients are observed and monitoring regularly during a procedure and vital signs are recorded
    b. clinical guidelines are followed in relation to monitoring for post-procedural complications that should include clinical deterioration and clinical follow-up
    c. treatment plans are amended when required
    d. radiation dose assessments are conducted when required with documented follow-up
    e. adequate analgesia prescribed and sedation administered
    f. post-procedural and follow-up plan is outlined and adhered to with clear responsibilities.

STANDARD EIGHT: PATIENT RECORDS AND CLINICAL DATA

The establishment, implementation and management of patient records supports safe and high-quality care. The integrity of patient records is maintained to support their use for building the evidence base and quality assurance activities.

Standards

S8.1 Clinical data collection and management are planned and systematic to ensure data integrity.

S8.2 Access to patient medical records, and the storage, security, retention and the protocols for sharing them, comply with relevant jurisdictional legislation and guidelines.

Requirements

R8.1 Each patient record includes demographic data, diagnosis, the intent of treatment, relevant medical history, assessment, treatment record, procedure report, consultation notes including informed consent, treatment outcomes and clinical correspondence, such as referrals and letters back to the referring practitioner. It is available for each patient at the point of care.

R8.2 An appropriate record of measurement and technical parameters associated with individual patient treatments is kept. Each patient record has the facility to document standardised data for evaluation, and these data can be extracted for meaningful analysis, including audit purposes.

R8.3 All patient and treatment records are complete and contemporaneously maintained.

R8.4 Data from records can be used for reliable patient comparisons, to provide quality assurance, quality improvement and to optimise research opportunities.

R8.5 Patient medical records include procedural data and outcomes that contribute valuable information to support clinical audits, clinical trials, analysis of patient outcomes, relevant Australian and New Zealand registry requirements, and to develop the evidence based for clinical and quality improvement.

Examples of evidence

(a) The provider has policies in place for healthcare record management, including access, storage, security, consent and sharing of patient information, and clear procedures in place to implement the content of such policies.
(b) The provider has a policy for the collection and recording of specific information in relation to IR and INR procedures, which is consistently followed and revised as necessary.
(c) Policies are implemented at the facility, which is indicated by staff familiarity with healthcare record management (e.g. regular data backup).
(d) Patient medical records are complete and up-to-date, and are a comprehensive source of information about a patient's medical care.
(e) Staff report that they have timely access to patients' records to facilitate quality care (including general medical records).
(f) Patient medical records demonstrate that specific information in relation to interventional radiology and interventional neuroradiology procedures is routinely collected in a standardised format for relevant analysis.
(g) There is a system for recording technical parameters associated with patients' treatment. The data recorded is reliable, and is in a format that can be utilised for quality assurance and control, and for research purposes.

(h) Patient records are secure, even if accessible on a personal device, and systems are in place to ensure data are not lost in the event of power outage or software virus.
(i) Archiving of patient records is consistent with jurisdictional legislation.

STANDARD NINE: WORKPLACE HEALTH AND SAFETY

Work health and safety plans should be in place to cover workplace health and safety risks, including the safe handling of medications, infection prevention and control, including the availability of appropriate personal protective equipment, control of hazardous chemicals, occupational violence and aggression, and other identified risks.

Standards

S9.1 Policies and processes are compliant with the relevant jurisdictional work/occupational health and safety legislation.

S9.2 The facility is safe and without risks to health for workers, patients and the general public, so far as is reasonably practicable.

S9.3 Health and safety risk to workers, patients and the general public is effectively managed.

S9.4 Workers are regularly consulted in relation to workplace health and safety issues.

Requirements

R9.1 Policies and processes must be implemented to ensure the provision of a safe environment for workers, patients and the public.

R9.2 The provider must:

(a) Identify potential workplace health and safety hazards
(b) Assess the risk of each identified hazard (including likelihood of happening, degree of harm)
(c) Implement measures to eliminate or minimise the risks identified
(d) Regularly review implemented risk mitigation measures.

R9.3 The provider must consult with workers when:

(a) Developing risk management plans
(b) Proposing changes to the environment, policies or processes that may affect health and safety
(c) Resolving health and safety issues.

R9.4 The provider must document and notify the regulator of all work-related injury and dangerous incidents that could expose people to health and safety risk, and maintains records as required.

R9.5 Any concerns raised by staff are seriously considered by the provider and appropriate action taken.

Examples of evidence

(a) Current risk management plan and previous versions, which demonstrate that plans are reviewed regularly and updated as necessary.
(b) Register of workplace injuries, which is up-to-date.
(c) Copies of notifications of workplace health and safety incidents to the relevant regulator.
(d) Meeting minutes or correspondence that demonstrate consultation with workers on health and safety issues.
(e) Records of health and safety inspections, and any resulting actions.

STANDARD TEN: RADIATION SAFETY

All diagnostic and therapeutic procedures are optimised to ensure that adequate clinical outcomes are obtained while ensuring the safety of patients, personnel and the environment.

Standards

S10.1 Plans, policies and processes are compliant with the relevant radiation safety legislation and regulations, and directions of regulatory authorities or advisory bodies.

S10.2 Ionising radiation doses are managed to minimise risk to workers,[iv] patients and the public.

S10.3 Appropriate services, equipment and resources are available for routine monitoring of radiation sources, and to assess radiation exposure or contamination in emergency situations.

S10.4 Radiation safety protocols are regularly reviewed to comply with radiation protection regulations.

Requirements

R10.1 Policies and processes must adhere to the relevant jurisdictional radiation safety, protection and/or control legislation.

R10.2 A radiation safety management plan must be developed, reviewed and implemented by a medical physicist, and be proportional to the risk posed by the radiation sources at the facility.

R10.3 The radiation safety management plan must clearly define the responsibilities and delegations of persons involved with radiation exposures and radiation safety management.

R10.4 All individual doses to occupationally exposed persons and the public are as low as reasonably achievable (ALARA).

R10.5 Once clinically justified, examinations must be conducted and technique optimised, so that the dose to the patient is the lowest necessary to achieve the clinical aim (i.e., dose reduction strategies are implemented to ensure acceptable image quality and minimise the need for a repeat exposure).

R10.6 Shielding and appropriate protective devices must be available, and are utilised in accordance with the provider's policy.

R10.7 All personal protective clothing utilised is examined annually, or as required, to confirm shielding integrity.

R10.8 The provider must issue approved dose monitors to workers who may receive an annual effective dose of more than 1 mSv, keep records of radiation doses and monitor the cumulative dose for each individual to ensure it is not higher than the prescribed dose limit.

R10.9 A register of equipment used to deliver ionising radiation must be maintained, and the provider must have a systematic process to receive and address safety guidance or notifications from suppliers and notices issued by regulators.

[iv] 'Workers' includes contractors and consultants who may not employees.

R10.10 The provider must respond to all supplier safety guidance or notifications, and notices issued by regulators, in a reasonable timeframe to ensure equipment remains as safe as possible or processes are amended accordingly.

R10.11 The provider must have access to suitable equipment, and engage appropriately trained personnel to allow assessment and survey of the facility's equipment and premises to ensure radiation safety.

R10.12 A quality assurance program appropriate to the facility is established, maintained and regularly reviewed.

R10.13 Radiation safety protocols should be reviewed annually, and strategies are developed and implemented to rectify any issues with equipment, staff or processes that are not compliant with the radiation safety management plan or regulations.

Examples of evidence

(a) A responsible person has been identified to oversee radiation safety and protection.
(b) Policies and processes that support compliance with radiation safety, protection and/or control legislation are actively followed. For example, illustrated signs are in prominent places advising patients to alert staff if they may be pregnant, and warning signs are at general access points. In some jurisdictions, a radiation safety officer must be appointed.
(c) A radiation safety management plan and associated documentation, and facility review demonstrates the plan has been implemented.
(d) Staff interviews indicate that those who have roles in radiation protection are aware of their responsibilities and fulfil them.
(e) A register of all workers involved in which includes:
    a. the details of licensed areas of work
    b. specific responsibilities
    c. radiation safety training completed
    d. personal dose monitoring results.
(f) Staff demonstrate best practice use of personal protective equipment.
(g) A record is kept of the annual integrity check for personal protective equipment and clothing.
(h) A register of radiation-emitting equipment and radiation sources, including records of:
    a. supplier notifications and resulting action
    b. results of regular assessment and surveillance of equipment.
(i) Records demonstrate the implementation of a quality assurance program, including:
    a. a committee of relevant personnel to review high-dose procedures, those exceeding national reference levels and procedures involving high-dose notifications
    b. measurement of physical parameters of equipment
    c. corrective action taken if measured values are outside established core limits
    d. verification that appropriate clinical protocols are used
    e. records of procedures and results, checks of dosimetry, and reference and monitoring equipment
    f. resulting action to ameliorate any identified issues.
(j) Annual audit of radiation safety protocols and evidence of addressing any identified issues.
(k) All workers specialised in the appropriate area and, where required, hold an applicable licence or permit.
(l) The plan meets any relevant code/s for Radiation Protection in Medical Exposure.

STANDARD ELEVEN: CLINICAL INCIDENT

Participation in incident reporting and managing programs provides confidence that procedures are delivered safely. Incident data is used as a tool for quality improvement and prevention of error.

Standard

S11.1 Incident reporting and management promotes a culture of continuous improvement and prevention of error.

Requirements

R11.1 Clinical incidents and near misses are reported by staff and appropriately recorded.

R11.2 The provider must have a systematic process to review clinical incidents, including root cause analysis where appropriate, to identify required change and improvement.

R11.3 The provider should have a policy on open disclosure of patient adverse events. The interventional radiologist or interventional neuroradiologist involved in the patient's clinical care is responsible for undertaking open disclosure, as per local hospital policies.

R11.4 Open and timely discussions should occur with patients and their families about incidents that could have resulted in, or did result in, harm while a patient was receiving care, in accordance with the provider's policy on open disclosure.

R11.5 Thematic analysis of incidents and patient feedback should be used to identify systemic issues and drive system improvements.

R11.6 Incident data and outcomes of investigations should be shared with staff, with the focus being to collectively learn from experience and prevent unnecessary harm.

Examples of evidence

(a) Clinical incidents are thoroughly documented in a timely manner.
(b) A record of the notification of an appropriate clinical incident or near miss is made according to local policies and to regulatory authorities, as required.
(c) Records indicate that the details of incidents have been reviewed, and strategies have been implemented to reduce the risk of a similar incident occurring.
(d) Patient records (or other correspondence) demonstrate appropriate discussions were initiated with patients.
(e) Records of meetings or correspondence advising staff of previous incidents and any resulting change to policies and processes.

CHANGES TO THIS DOCUMENT

The College may amend this Standards of Practice for Interventional Radiology and Interventional Neuroradiology document at any time and will ensure that future amendments comply with applicable law.

RELATED DOCUMENTS

- RANZCR Standards of Practice for Clinical Radiology, V11.2
- RANZCR Specialist Interventional Radiology and Interventional Neuroradiology Range of Practice, V1.0
- RANZCR Code of Ethics

ACKNOWLEDGEMENTS

The RANZCR Standards of Practice for Interventional Radiology and Interventional Neuroradiology are based on a set of Practice Standards for Radiation Oncology[18] developed and published by the Royal Australian and New Zealand College of Radiologists, Australian Society of Medical Imaging and Radiation Therapy and the Australasian College of Physical Scientists and Engineers in Medicine. These standards also utilise background material from the Cardiovascular and Interventional Radiology Society of Europe's (CIRSE) Interventional Oncology Quality Assurance program.[19]

The Faculty of Clinical Radiology Council gratefully acknowledges the extensive work undertaken by the Interventional Radiology Standards Working Group for the development of version 1 of the Standards and the Interventional Radiology Committee for leading this work.

Members of the Interventional Radiology Standards Working Group are: A/Prof Winston Chong (Chair), Dr Nick Brown (Chair, Interventional Radiology Committee), A/Prof Ronil Chandra, Dr Andrew Cheung, Dr Con Phatouros, A/Prof Gerard Goh, Dr Jim Koukounaras, Dr Matthew Lukies, Dr Colin Chong, Dr Martin Dobes and Mr Murray McLachlan (consumer representative).

Members of the Interventional Radiology Committee are: Dr Nick Brown (Chair), A/Prof Dinesh Varma (Chief of Professional Practice), A/Prof Winston Chong, A/Prof Ronil Chandra, Dr Andrew Cheung, A/Prof Warren Clements, Dr Terry Kok, A/Prof Andrew Holden, A/Prof Will McAuliffe, Dr Craig Ferguson, Dr Wen Ter Kan, Mr Murray McLachlan (consumer representative).

DEFINITIONS

Acceptance testing	The process of verifying that equipment (both hardware and software) operates to performance specifications agreed between the vendor and customer according to a mutually agreed acceptance protocol. This happens initially when the equipment arrives at the organisation, and additionally when it is handed back to the organisation after service work has been completed.
College	The Royal Australian and New Zealand College of Radiologists.
Commissioning	The process of setting up an item of equipment and/or software and acquiring all relevant data required to make it clinically useable in a specific site. Therefore, the commissioning process will depend on clinical requirements in a particular centre and other equipment available.
Consultation	Initial consultation pre-treatment: A formal and documented interaction between an interventional radiologist or interventional neuroradiologist and the patient to discuss their care and options for treatment, the recommended procedure, and likely benefit and potential complications of treatment. The treating interventional radiologist and interventional neuroradiologist must be responsible for the discussion of and decision about treatment options with the patient. Sufficient time must elapse between the consultation and the start of treatment for the patient to make an informed and meaningful consent. Consultation post-treatment: A formal and documented interaction between an interventional radiologist or interventional neuroradiologist and the patient to discuss the outcome of the treatment, the ongoing treatment plan and the follow-up plan.
Dosimetry	The measurement of absorbed dose in matter resulting from exposure to ionising radiation. 'Dosimetry' refers to the measurement of physical dose and the provision of these dose measurements for the purpose of treatment monitoring.
Equipment	For the purposes of this document, equipment includes all medical devices (hardware and software) and consumables used for: - patient imaging for planning, delivery and verification - delivery of treatment to a patient - monitoring, measuring and/or otherwise contributing to patient treatment and care.

Facility	Any physical location at which IR and/or INR services are planned and/or delivered.
Governance	The totality of measures in place within an organisation to ensure that it operates effectively and accountably. In a healthcare context, it can be considered under at least two headings: clinical governance and corporate governance. 'Clinical governance' is the term used to describe a systematic approach to maintaining and improving the quality of patient care within a clinical care setting, health program or health system. It is about the ability to produce effective change, so that high-quality care is achieved. It requires clinicians and administrators to take joint responsibility for making sure this occurs.[20] Corporate governance in a healthcare organisation addresses, 'those structures, systems and processes that assure the quality, accountability and proper management of its operation and delivery of service'. This includes everything from delivering an organisation's strategic goals to having systems in place to keep staff and patients safe.
Incident	An error, near miss, or any adverse event relating to patient care or to patient, visitor and staff safety.
Interventional Neuroradiologist	Person who is registered as a medical practitioner, is a fellow of the appropriate professional body or equivalent and is licensed or otherwise authorised to practice in the field of Interventional Neuroradiology.
Interventional Radiologist	Person who is registered as a medical practitioner, is a fellow of the appropriate professional body or equivalent and is licensed or otherwise authorised to practice in the field of Interventional Radiology.
Medical Physicist	A health professional, with specialist education and training in the concepts and techniques of applying physics in medicine and practices in one or more specialty areas of medical physics.[21] Diagnostic imaging medical physicists are registered on the ACPSEM Register of Qualified Medical Physics Specialists in the Radiology Medical Physics Specialty.
Medical Radiation Practitioners/Sonographers	Medical Radiation Practitioners/Sonographers are responsible for producing high-quality medical images that assist medical specialists and practitioners to describe, diagnose, monitor and treat a patient's injury or illness. They need the scientific and technological background to understand and operate the advanced medical imaging equipment used in Diagnostic and Interventional Radiology and Interventional Neuroradiology departments.[22]

Networked Centre	A comprehensive centre with highly specialised services including Mechanical Thrombectomy and appropriately trained/skilled personnel available (24 hours a day, seven days per week) to treat acute stroke. Networked centres are generally located within a large, tertiary referral centre.
New technologies	The first time a particular procedure or item of equipment is used in a particular organisation.
Novel technologies	The first instance of application of a procedure or item of equipment.
Patient pathway	The route or path a patient will take from presentation to the facility to the completion and follow up after treatment. The pathway gives an outline of what is likely to happen on the patient's journey.
Patient record	The primary source of information for an interventional radiology or interventional neuroradiology procedure that includes demographic data, diagnosis, the intent of treatment, relevant medical history, assessment, treatment record, consultation notes including informed consent, treatment outcomes and clinical correspondence, such as referrals.
Quality assurance	All the planned and systematic activities implemented within the quality system, and demonstrated as needed, to provide adequate confidence that an entity will fulfil requirements for quality. Quality assurance for interventional radiology and interventional neuroradiology equipment is the process of making sure equipment and techniques work as intended. It can include carrying out tests before equipment is used, to make sure it is producing the right effects. It can also involve periodic checks for possible faults, often as part of regular equipment servicing. Quality assurance inspections are usually a legal requirement for X-ray imaging equipment.
Quality care	Care based on commonly accepted best practice guidelines and the associated patient outcomes.
Quality improvement	Actions taken to review and enhance the quality of a process, service and/or patient experience.
Radiation safety	Measures taken to reduce the risk of exposure when working with sources of ionizing radiation. These may include the use of devices, equipment, distance, barriers and restrictive working practices. This is in line with the ALARA principles of radiation safety for time, distance and shielding.
Radiation safety management plan	A management plan as per Schedule A of the Radiation Protection Series C-5 Code for Radiation Protection in Medical Exposure,[23] or as per any local legislation and guidelines.

Radiographer	Radiographers are registered as a diagnostic radiographer with MRPBA/AHPRA
Responsible person	The person who has the overall management responsibility and control of radiation-producing equipment or medical practice. It may be a person, corporation, chief executive officer or director of medical services.
Risk register	A tool to document and manage risks. It will typically set out the likelihood and severity of each risk, together with any measures that have been put in place to minimise their impact.

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