The credentialling of radiologists in Australia

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Executive summary

We were commissioned by the Royal Australian and New Zealand College of Radiologists (RANZCR) to examine the following aspects of credentialling in radiology:

1 the purpose of credentialling;
2 the state of Australian and international evidence that credentialling will or could improve the safety and quality of clinical radiological services;
3 the specification of standards of practice relevant to credentialling in radiology;
4 the scope of clinical practice for the delivery of radiology services;
5 governance of credentialling in radiology;
6 how credentialling for interventional radiology may differ from credentialling for diagnostic radiology;
7 legal and ethical issues in credentialling in radiology;
8 approaches to performance measurement; and
9 resources required for credentialling.

Our approach to these issues was guided by the *Standard for Credentialling and Defining the Scope of Clinical Practice*[1], a generic national standard published in 2004 by the Australian Council for Safety and Quality in Health Care.

Our consideration of the potential for credentialling of radiologists took account of the following.

- The definition of credentialling, and the distinction between *credentialling*, which focuses on individual practitioners, and *accreditation*, which is concerned with organisations that deliver clinical services.
- The components of a credentialling system, and the respective responsibilities of organisations that conduct credentialling and of clinicians who seek to be credentialled.
- The nature of diagnostic and interventional radiology practice in Australia, including training requirements, subspecialisation, continuing professional development, and the distribution and demographic characteristics of the radiology workforce. We particularly noted the unique features of the diagnostic paradigm that defines the nature of diagnostic radiology.

We also noted the relatively large proportion of radiologists who work in the private sector, including independent private practice, and we drew attention to the challenges of establishing a credentialling system for private practice.

We undertook a brief review of credentialling and related systems in Australia and internationally. Our review of Australian systems encompassed the implications of the Radiology Agreement 2003–2008 Quality and Outlays Memorandum of Understanding, the joint National Association of Testing Authorities – The Royal Australian and New Zealand College of Radiologists Standards of Practice & Accreditation Program, credentialling in interventional radiology, credentialling in nuclear medicine, the specific continuing professional development requirements for radiologists who supervise magnetic resonance imaging, and institutional radiology performance review. Our review of credentialling of radiologists in the

USA examined the distinctive roles of the American Board of Radiology, the American College of Radiology (ACR), the Accreditation Council for Graduate Medical Education and the Joint Commission on Accreditation of Health Care Organizations, and observed that Australia could make use of the extensive set of radiology practice guidelines issued by the ACR. We also explored the requirements for radiology practice set down by the European Association of Radiology, and we examined methods of 'appraisal' of radiologists put forward by the Royal College of Radiologists (RCR). The RCR methods provide a model that could potentially be adapted for Australia. We identified several examples of performance measurement in radiology in Australia and overseas, and again noted the potential adaptability of the RCR approach to performance measurement.

We then examined the need for and value of credentialling in radiology. We compiled information on the extent and nature of errors in diagnostic radiology, noting the high frequency of perceptual and interpretive errors, often detected with the benefit of clinical hindsight. In this context, we explained the RCR preference for the term 'discrepancies' rather than 'errors'. We examined how activities that could be part of a credentialling system, such as 'double reading' of images and 'open disclosure', could contribute to minimising errors.

We searched the published literature for empirical evidence of the effectiveness of credentialling in improving and sustaining the safety and quality of radiology services. We found no empirical evidence for the benefit of credentialling in radiology, despite our intuitive appreciation of its value, and little or no empirical evidence for the benefit of credentialling in any other clinical field.

In our conclusions, we acknowledged that, despite the lack of empirical evidence for its effectiveness, the development of an Australian credentialling system for radiologists is warranted. We considered options for governance of a credentialling system, suggesting that the RANZCR is the only body that has the authority and capacity to establish, govern and manage a credentialling system. The RANZCR could either develop and manage a credentialling program and offer it to Fellows regardless of their employment arrangements, or the RANZCR could offer a credentialling program to Fellows in independent practice and offer credentialling materials and guidance to organisations that employ or engage radiologists in the public and private sectors. It would be desirable for any credentialling program to be uniform regardless of the sector of practice in which it is conducted. If an employer is involved in the credentialling process, it should be conducted jointly with the RANZCR and clearly identify the roles of both the employer and the RANZCR. We listed the steps to be taken in establishing and running a credentialling system, emphasising the resources needed to make the system work.

Finally, we recommended that the RANZCR provides leadership by establishing a credentialling system on a pilot basis, evaluating the pilot program, and publishing the results of the evaluation.

Contents

Abbreviations

ABR	American Board of Radiology
ACGME	Accreditation Council for Graduate Medical Education (USA)
ACHS	Australian Council on Healthcare Standards
ACR	American College of Radiology
ADIA	Australian Diagnostic Imaging Association
ANZAPNM	Australian and New Zealand Association of Physicians in Nuclear Medicine
ASUM	Australasian Society for Ultrasound in Medicine
BMA	British Medical Association
CME	Continuing medical education
CPD	Continuing professional development
CT	Computerised tomography
DDU	Diploma in Diagnostic Ultrasound
EAR	European Association of Radiology
GP	General practitioner
IRSA	Interventional Radiology Society of Australia
IV	Intravenous
JCAHO	Joint Commission on Accreditation of Health Care Organizations (USA)
JNMCAC	Joint Nuclear Medicine Credentialling and Accreditation Committee
MBS	Medical Benefits Scheme
MOC	Maintenance of Certification
MoU	Memorandum of understanding
NATA	National Association of Testing Authorities
MRI	Magnetic resonance imaging
PET	Positron emission tomography
QUDI	Quality Use of Diagnostic Imaging (program of the RANZCR)
RACP	Royal Australasian College of Physicians
RANZCR	Royal Australian and New Zealand College of Radiologists
RCR	Royal College of Radiologists (UK)
TIA	Transient ischaemic attack
UEMS	Union Européenne des Medicins Specialistes

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1 Introduction

1.1 Objectives and scope

We were commissioned by the Royal Australian and New Zealand College of Radiologists (RANZCR) to examine the following aspects of credentialling in radiology:

1. the purpose of credentialling;
2. the state of Australian and international evidence that credentialling will or could improve the safety and quality of clinical radiological services;
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6. how credentialling for interventional radiology may differ from credentialling for diagnostic radiology;
7. legal and ethical issues in credentialling in radiology;
8. approaches to performance measurement; and
9. resources required for credentialling.

Our approach to these issues was guided by the *Standard for Credentialling and Defining the Scope of Clinical Practice*, a generic national standard published in 2004 by the Australian Council for Safety and Quality in Health Care (ACSQHC). The national standard was written primarily to define requirements for the credentialling of medical practitioners who work in public and private hospitals. However, the principles set out in the *Standard* are readily adaptable to the various non-hospital as well as hospital settings where radiology is practised.

In most clinical fields, the process of credentialling is the responsibility of the employers of clinicians, such as public and private hospitals or regional health administrations that manage a number of public hospitals and community-based services. For the purposes of credentialling in radiology, *employment* can be interpreted broadly to refer to the salaried appointment of a staff medical officer, the contractual relationship between a public hospital and a visiting medical officer, or the agreement that gives a doctor rights of practice in a private hospital. Credentialling of radiologists working under these arrangements could appropriately be undertaken by employers. However, a large proportion of radiologists are self-employed in private practice, unaffiliated with a hospital or a corporate health service. For self-employed radiologists, a credentialling model must be found that does not depend on an employer. As the professional body that defines standards of training and competencies in radiology, the RANZCR could have important roles in the conduct of credentialling for self-employed radiologists, and/or the development of credentialling systems for both employed and self-employed radiologists. This report concentrates on these potential roles of the RANZCR.

1.2 Background - radiology services

1.2.1 Clinical paradigm - overview

Radiology is a field of medicine that depends on creating, interpreting and using images of the internal structure of the human body for diagnosis, assessment and/or the planning or performance of interventions. It relies on complex technology for the creation of images.

Radiologists have a scope of practice which encompasses:

- using or overseeing the use of complex imaging technology;
- the detection, diagnosis and assessment of pathology by means of imaging; and
- the planning and performance of diagnostic and therapeutic interventions, guided by imaging systems.

The clinical paradigm of radiology is characterised by brief encounters with patients. Radiologists have responsibility for the effective performance of particular diagnostic or interventional procedures, but they do not have responsibility for any subsequent management of patients. Little or no opportunity exists for radiologists to find out about the accuracy or value of the diagnostic imaging that they perform, or to obtain information on patient outcomes following interventional procedures. For example, if a radiologist detects and diagnoses a lesion that is subsequently excised by a surgeon, it is most unusual for the radiologist to learn of the surgical diagnosis or of any outcomes that follow surgery. There is no established pathway for such communication, other than in the context of a complaint relating to misdiagnosis by the radiologist.

Patients are referred to radiologists for specific imaging or interventional procedures. The referring doctor usually expects the radiologist to carry out the requested procedure, rather than determine whether it is necessary or appropriate. Indeed, despite having specialist expertise in imaging, the radiologist has little discretion to undertake a different (and perhaps more appropriate) procedure and where substitution of a procedure is allowed, the radiologist is required to take all necessary steps to consult with the referring doctor before doing so.

1.2.2 Diagnostic radiology

Diagnostic radiology involves:

- the acquisition of images using modalities such as plain and contrast X-ray, ultrasound, computerised tomography (CT) and magnetic resonance imaging (MRI);
- the interpretation of these images; and
- the preparation of reports on the findings.

The radiologist's responsibility comprises (a) seeking, and diagnosing or excluding, the condition for which the patient has been referred; and (b) detecting any other condition that may be present in the part(s) of the body that have been the subject of the imaging procedure(s).

The quality of diagnostic radiology depends upon:

- the radiologist's knowledge of the clinical findings (history, clinical examination, other diagnostic tests, and medication);
- the technical quality of the image;
- the radiologist's expertise in interpreting the image; and
- the quality of the radiologist's report.

A technically poor image impairs reading and interpretation. Most litigation against radiologists reportedly results from image-reading errors, which are discussed in section 4.2.

1.2.3 Interventional radiology

Interventional or procedural radiology is a relatively small part of the specialty of radiology. It comprises medical procedures performed by radiologists using medical imaging systems for guidance – 'keyhole surgery with X-ray vision'. Over the last decade, the number and complexity of minimally-invasive procedures that require radiological guidance has increased enormously. The most common procedure in interventional radiology is imaging-guided biopsy. Other common interventional radiology procedures include angioplasty and stenting (other than in the coronary arteries, which are usually the province of interventional cardiologists), vascular embolisation (to prevent haemorrhage or close off cerebral aneurysms), percutaneous organ access and drainage (e.g. of cysts or abscesses), joint injections, and tumour ablation. Most Australian radiologists perform imaging-guided biopsies, and may also perform other procedures[2]. RANZCR training covers basic diagnostic angiography and interventional techniques including angiography, nephrostomy, abscess drainage and biopsy.

With regard to practice arrangements, outcomes and medico-legal issues, interventional radiology has many parallels with procedural specialties such as surgery and interventional cardiology.

Credentialling for interventional radiology is described in section 3.2.3.

1.2.4 Subspecialisation

The majority of radiologists in Australia are generalists in the sense that they undertake imaging and diagnosis of the full spectrum of pathology and use a variety of imaging modalities, such as X-ray, CT and ultrasound. The RANZCR does not offer subspecialty certification in any particular aspects of radiology. The situation is different in some other countries. For example, in the USA, many radiologists have additional subspecialty certification through the American Board of Radiology in neuro-radiology, nuclear radiology, paediatric radiology, or vascular and interventional radiology[3].

However, the RANZCR does have specific 'accreditation' requirements for radiologists in two areas: the supervision of MRI, and the reading of mammograms. A credentialling system also exists for interventional radiology, conducted by the Interventional Radiology Society of

Australia (IRSA), and for nuclear medicine, conducted jointly by the RANZCR and the Royal Australasian College of Physicians (RACP). In addition, the RANZCR sponsors special-interest groups in fields such as breast, cardiac, dento-maxillo-facial, abdominal, musculoskeletal imaging and MRI. The special-interest groups conduct discussion forums, disseminate practice information, support research, promote educational programs, develop outcomes monitoring systems, and provide advice to government and other agencies within their fields of expertise. While the RANZCR includes nuclear imaging in the training of radiologists, recognition as a nuclear medicine specialist in Australia is a separate program conducted under the auspices of the RANZCR and the RACP (see section 3.2.4).

In addition to general radiology, the RANZCR recognises the field of diagnostic ultrasound. A Diploma in Diagnostic Ultrasound (DDU) is offered by the Australasian Society for Ultrasound in Medicine (ASUM) to medical practitioners who are registered as specialists in obstetrics and gynaecology, internal medicine or radiology, and who fulfil ASUM training requirements in medical ultrasound[4]. Training in ultrasound is included in the requirements for Fellowship of the RANZCR, and most radiologists who perform ultrasound do not hold a DDU. However, the RANZCR is extensively involved in ultrasound management processes at health-system level, such as accreditation processes for ultrasound practices, including those concentrating exclusively in obstetric ultrasound.

1.2.5 Training requirements

The Fellowship training program in radiology is set by the RANZCR. It includes defined training standards. It is of at least five years' duration, and the first four years must be undertaken at approved training sites in Australia, New Zealand or Singapore. The training standards refer to minimum periods of practical experience, with specification of training and experience requirements for each modality or field of radiology. Training requirements cover radiographic techniques, ultrasound, MRI, nuclear medicine, paediatric radiology and interventional radiology. Details of the requirements are available on the RANZCR website[5]. Unlike many overseas radiology training programs, the RANZCR training program does not have a rigid structure based on particular imaging modalities or systems. Instead, it encourages an integrated approach to each clinical problem and allows for flexibility in trainee rotations.

During the fifth year of training, candidates may participate in an Advanced Training Position in a variety of modalities or subspecialties such as nuclear medicine, MRI, mammography, ultrasound, interventional radiology, or paediatric radiology.

1.2.6 Continuing professional development

The aim of the RANZCR Continuing Professional Development (CPD) Program[6] is

> 'to assist Participants to develop, maintain and improve their competence and performance not only in their chosen specialty of radiology, but also in more generic areas associated with the practice of medicine.'

Participants require a total of 180 CPD points over a triennial cycle and are encouraged to acquire these in seven categories:

- Recertification and Quality Improvement
- Involvement in Professional and Clinical Governance
- Involvement in Education
- Self-directed Learning Activities
- Radiology Research
- Publications
- Attendance at Conferences and Meetings.

Examples of activities that are acceptable under 'Recertification and Quality Improvement', 'Involvement in Education' and 'Self-Directed Learning Activities' are given in Box 1.1. The current triennium covers the three years January 2004 to December 2006.

Box 1.1: Examples of activities acceptable in the RANZCR CPD program

Recertification and Quality Improvement (maximum 120 points per triennium) – includes clinical audit, peer review of performance, formal evaluation of peer performance for medical council or medical board, multidisciplinary case meetings with feedback, and quality improvement activities. Education (maximum 90 points per triennium) – includes education of trainees, supervision of trainees, supervision of research students, supervision of overseas trained doctors, and examining. Self-Directed Learning (maximum 90 point per triennium) – includes formal post-graduate study, self-directed learning, web- or DVD-based learning via RANZCR or Radiological Society of North America, journal reading, reflective diary and sabbatical.

Special CPD requirements exist for radiologists who perform mammography and MRI. Participants involved in mammography are required to accumulate a total of 15 CPD points in mammography or closely related topics in which mammography is the main component, within their overall CPD. BreastScreen requires its readers to participate in an audit and feedback to evaluate their performance in detecting invasive and small invasive cancers, and they get feedback that gives them information about invasive and interval invasive cancers not detected at screen reading. [7]. This participation would enable them to gain up to 30 CPD points in the RANZCR CPD program, Radiologists who supervise MRI are required to accumulate a total of 60 CPD points in MRI-related topics (across any of the CPD categories). The RANZCR has recently reduced the MRI CPD supervising requirement from 90 to 60 points in the triennium. In addition, radiologists who interpret MRIs must now accumulate 30 MRI-specific CPD points per triennium.

1.3 Radiology practice in Australia

In January 2005 an estimated 1,300 radiologists were practicing in Australia (6.4 per 100,000 population). Of these 17 percent were women, but the proportion is increasing - approximately 34 percent of current trainee radiologists are women[8].

As described in section 1.1, radiologists work in many types of private- and public-sector settings, including private- and public-sector hospitals, corporate practices and independent

private practices. According to the 2004 RANZCR Workforce Survey, 69 per cent of respondents were primarily employed in the private sector and 30 per cent in the public sector. A large proportion of radiologists (44 per cent) indicated they also had a secondary work arrangement, mostly within the public sector. Most radiologists working in the public sector are hospital-based, contributing to the management of both inpatients and outpatients.

A total of 720 fully qualified practicing radiologists responded to the 2004 RANZCR workforce survey. Their responses gave the following picture of radiology practice.

- Corporate practice: Three-quarters of the radiologists working in private settings were associated with publicly listed companies.

- Work locality: More than three-quarters (77 percent) of the respondents worked in capital cities, more than one-tenth (11 percent) worked in non-capital urban areas with populations exceeding 100,000, one-tenth worked in regional and rural centres with populations in the range 25,000 to 100,000, and the remainder worked in smaller centres and other rural settings. The distribution of radiology practice reflected radiologists' places of residence.

- Hours worked: Respondents worked 43.2 hr per week on average (median 45.0 hr).

- Radiology modalities performed: The proportions of respondents who performed the various modalities were as follows.

  97% General radiography and fluoroscopy
  97% Ultrasound
  94% CT
  80% Basic interventional radiology
  75% Diagnostic mammography
  61% Bone densitometry
  51% MRI
  29% Screening mammography (BreastScreen)
  21% Advanced interventional radiology
  11% Nuclear medicine.

  (MBS data suggest that 38 percent of radiologists perform MRI, and that 9.4 percent perform nuclear medicine).

- Type of radiologist: Respondents described themselves as follows.

  40% General radiologist with a subspecialty interest
  39% General radiologist
  21% Subspecialty radiologist
  <1% Other

1.4 Methods

In order to fulfil the objectives set out in section 1.1, we undertook the following.

A. We examined a wide range of major Australian framework, policy and planning documents on radiology services. In our review of the documents we concentrated on (i) safety and quality improvement in general, and (ii) specific points relevant to the development, implementation and management of credentialling processes.

B. We studied the generic national *Standard for Credentialling and Defining the Scope of Clinical Practice*[1], concentrating on the elements that have particular implications for the credentialling of radiologists.

C. We carried out an abbreviated search of national and international literature on effective approaches to credentialling relevant to radiology, and on evidence of the benefits of credentialling for safety and quality in radiology. We also searched for existing guides relevant to the credentialling of radiologists.

D. We undertook limited consultation with key informants interested in the development of credentialling in radiology. Our aim was to canvass their knowledge of and views on major issues in a credentialling system for radiology. The individuals, who were identified for us by the RANZCR, are listed in Appendix A. Those whom we consulted practised in various professional settings (hospital practice, private non-corporate practice and corporate practice) and had various specialty and subspecialty interests.

E. We synthesised the information and concepts from (A) to (D).

1.5 Structure of this report

In Chapter 2 of this report, we define and distinguish between *credentialling*, which focuses on individual practitioners, and *accreditation*, which is concerned with organisations that deliver clinical services. We link credentialling with *defining the scope of clinical practice* (synonymous with *delineation of clinical privileges* or *privileging*). We then explain why credentialling is essential for the safety and quality of all types of health services, and describe the principles and components of a credentialling system.

In Chapter 3, we give an overview of the current status of credentialling in radiology, and relevant current developments. We describe the nature of radiology services, and identify the aspects relevant to credentialling. Our overview makes reference to a published Australian and international literature, and focuses on:

- the purpose of credentialling processes;
- structure and content of existing credentialling standards;
- governance of credentialling systems in or applicable to radiology services; and

- evidence for the effectiveness of credentialling in improving the quality and safety of radiology services.

In Chapter 4, we analyse the components of credentialling in radiology – who is to be credentialled, how credentialling could be done and managed, who carries out credentialling, and what the consequences of credentialling might be. We include a brief description of legal, ethical, workforce and industrial issues associated with the development of credentialling systems for radiology, and comments on the possible resource requirements for the development and implementation of credentialling systems for radiology.

In Chapter 5, we draw conclusions and suggestions for the next steps in the development of credentialling systems for radiology.

2 Credentialling and related processes: definitions, concepts and components

2.1 Definition of *credentialling*

The national standard[1] for the credentialling of medical practitioners defines *credentialling* as:

> '…the formal process used to verify the qualifications, experience and professional standing and other relevant professional attributes for the purpose of forming a view about their competence, performance and professional suitability to provide safe, high quality health care services within specific organisational environments.'

Credentials are:

> 'The qualifications, professional training, clinical experience, and training and experience in leadership, research, education, communication and teamwork that contribute to a medical practitioner's competence, performance and professional suitability to provide safe, high quality health care services…a medical practitioner's history of and current status with respect to professional registration, disciplinary actions, indemnity insurance and criminal record are regarded as relevant to their credentials.'

The national standard[1] also defines the following terms that are incorporated in its definition of credentialling:

- 'Competence. The demonstrated ability to provide health care services at an expected level of quality and safety.'
- 'Medical practitioner. A person who is registered to practise medicine within the relevant State or Territory.'
- 'Organisation. A public or private hospital or freestanding day procedure facility. The term includes a division or campus which is a component of a larger organisation but whose manager is responsible for credentialling and defining the scope of clinical practice of medical practitioners within a specific local environment.'
- 'Performance. The extent to which a medical practitioner provides health care services in a manner which is consistent with known good practice and results in expected patient benefits.'

These definitions highlight five points.

- The purpose of credentialling is to ensure that practitioners provide safe, high-quality health services in accordance with known good practice and the achievement of expected patient benefits. It follows that credentialling processes should be designed solely to fulfil this purpose. They are not intended to fulfil other bureaucratic requirements for documentation, or to provide health-care institutions with mechanisms for the management of other professional and administrative difficulties. Separate processes are needed to manage these difficulties.

- Credentials reflect an individual practitioner's professional capacity within the context of specific health-care environments.
- Credentials encompass the factors that contribute to a medical practitioner's performance but do not include any assessment of actual performance. The process of *credentialling* goes further – it includes forming a view about clinicians' performance.
- Credentialling processes take account of numerous attributes of candidate clinicians, including not only qualifications, but also skills, experience, and other qualities and attainments. They encompass leadership, research, education, communication and teamwork, as well as expertise in the direct clinical management of patients. They assess clinicians' demonstrated ability as practitioners, rather than their assumed or theoretical capacity.
- Credentialling processes are carried out for, and within the context of, particular organisational environments, which may be specific practice settings or specific multi-site health-care organisations.
- Credentialling processes assume that a candidate for credentialling fulfils the registration requirements of the professional registration board in the relevant State or Territory.

The national standard[1] concentrates exclusively on credentialling for practice in public and private hospitals, including free-standing day-procedure facilities. Strictly, its provisions do not apply to practice in other private sector settings. However, the principles and procedures that it sets out could easily be adapted for other private settings.

2.2 Accreditation

Accreditation has been defined[9] as:

> 'a process of external peer review of an organisation's processes and performance using defined standards with the aim of quality improvement.'

The national standard for credentialling emphasises that accreditation depends on two conditions:

> 'an explicit definition of quality [criteria] (i.e. standards) and an independent review process aimed at identifying the level of congruence between practice and quality standards.'

Thus, accreditation refers to an organisation, while credentialling is concerned with individual practitioners. However, the concepts of credentialling and accreditation are inter-dependent. Criteria for accreditation often include the existence of credentialling policies and processes and their consistent application. Conversely, given that credentialling refers to the capacity of a practitioner to provide safe, high-quality health services within specific organisational environments, an effective credentialling process is most likely to be sustainable in an accredited health-care environment.

2.3 The scope of clinical practice and organisational capacity

The national standard[1] states that:

> '***Defining the scope of clinical practice*** follows on from credentialling and involves delineating the extent of an individual medical practitioner's clinical practice within a particular organisation based on the individual's credentials, competence, performance and professional suitability, and the needs and capability of the organisation to support the medical practitioner's scope of clinical practice.'

The term *clinical privileges* is defined[1] as:

> 'The authorised extent of an individual medical practitioner's clinical practice within a particular organisation…'

Thus, the specification of clinical privileges is the end result of the process of defining the scope of clinical practice.

Delineation of clinical privileges and *clinical privileging* are often used as synonyms for defining the scope of clinical practice. In the national standard[1], the term *defining the scope of clinical practice* is preferred because:

> '…the term "clinical privileging" creates an undesirable perception of a unilateral conferral of a benefit by an organisation…[while] the term "defining the scope of clinical practice"…suggests a strong, mutual relationship between the employing or contracting organisation and each medical practitioner, centred on the safety and quality of the health care services provided.'

The processes of credentialling and defining the scope of clinical practice overlap in that both involve a review of the same professional attributes and qualities of an individual. However, the process of defining the scope of clinical practice emphasises community and organisational need for particular services, as well as the capability of a health-care organisation to support these services.

The national standard[1] defines 'organisational need' as:

> 'The extent to which an organisation requires the provision of a specific clinical service, procedure or other intervention in order to provide a balanced mix of safe, high quality health care services that meet consumer and community needs and aspirations.'

It defines 'organisational capability' as:

> 'An organisation's ability to provide the facilities and clinical and non-clinical support services necessary for the provision of safe, high quality clinical services, procedures or other interventions.'

Factors that influence organisational capability include infrastructure such as equipment and physical facilities and the capacity to maintain and operate equipment, the availability of skilled

staff other than the credentialled individual (such as other professionals making up a multi-disciplinary team), capacity to manage clinical complications, and established pathways and systems for referral and follow-up.

2.4 Credentialling systems

2.4.1 Organisational framework

The essence of credentialling is an objective assessment of practitioners' capacity and performance. This requires an organisational framework that has the authority and capability to make such an objective assessment. For fields of practice that invariably occur in an institutional setting (e.g. intensive care or emergency medicine), the employing institution usually has this authority and has or can develop the capability to carry out credentialling of the practitioners that it employs. Equivalently, if a radiologist is *employed* by a health service, hospital or corporate practice, credentialling could be carried out by the employer. However, if a radiologist is *self-employed*, a credentialling agency is needed. The agency must have significant professional and community standing, resources and access to the necessary expertise. In Australia, the RANZCR is the only such agency. In principle, an external agency such as the RANZCR could carry out credentialling of employed as well as self-employed radiologists, if radiologists' employers accept its authority.

Whether credentialling is conducted by the employer or the RANZCR, the credentialling organisation is responsible for determining who is to be credentialled, how credentialling is to be done and who is to carry it out, and for specifying the credentialling criteria. This involves:

- developing policies and procedures for credentialling, based on accepted standards of practice and linked to safety and quality- improvement systems;
- developing governance arrangements to lead and oversee credentialling;
- determining the clinical services that are needed, and linking these to radiologists' scope of practice, with reference to both existing staff and recruitment;
- defining, by negotiation, the scope of practice for individual radiologists, with agreement on credentialling requirements that relate to the scope of practice;
- maintaining records that describe these commitments;
- compiling data to audit the performance of individual radiologists and the clinical units to which they contribute;
- using the data to monitor and report on the performance of individual radiologists and clinical units;
- maintaining records that contain these performance data; and
- examining and managing variations from expected performance.

2.4.2 Responsibilities of credentialling agencies and radiologists

Responsibilities of credentialling agencies

If the employer is responsible for credentialling, the employer must be able to provide the resources needed by radiologists to do their work in a manner that enables them to fulfil credentialling requirements within their defined scope of practice. These resources include equipment, services and staff with the requisite expertise. For example, if a hospital radiologist's credentials and scope of practice encompass renal artery stenting (to correct stenosis), the hospital must be able to provide the necessary equipment, staff and technical services for the procedure, provide pre-operative care for the patient, and provide post-operate care including the capacity to monitor the patent and detect and manage complications.

If an external credentialling agency (such as the RANZCR) is responsible for credentialling, this requirement is more problematic, as the credentialling agency is not in a position to ensure that the necessary resources are available. In these circumstances, the credentialling agency can only assess whether the radiologist has ascertained that resources are available for him or her to carry out the procedures specified in the scope of practice.

The employer or credentialling agency is also responsible for providing the governance capacity and infrastructure (such as information systems and support staff) for the management and conduct of the credentialling process itself.

Responsibilities of individual radiologists

The radiologist being credentialled is responsible for:

- maintaining his or her professional registration;
- participating in appropriate continuing professional development;
- providing agreed documentation;
- specifying, by negotiation, his or her scope of practice, and working within the defined scope of practice;
- contributing data, as agreed, for use in auditing his or her performance;
- collaborating in the review of audit data at agreed intervals;
- explaining variations from expected performance; and
- abiding by the determinations of employer or credentialling agency with regard to re-credentialling and re-defining scope of practice.

As described above, the radiologist must also take some responsibility for ensuring that the clinical resources needed for procedures that he or she undertakes are available, and that they function to a level necessary for these procedures to be carried out safely and effectively.

2.4.3 Credentialling system components

To accommodate the responsibilities listed in section 2.4.2 above, a credentialling system should have the following components, described in detail in the national standard[1].

1) Credentialling policies. These cover:
   - initial credentialling and re-credentialling;
   - verification of individual clinicians' credentials;
   - indemnity insurance;
   - short-term credentialling (e.g. of temporarily-employed clinicians, or in relation to major emergencies);
   - the introduction of new clinical services, procedures or other interventions;
   - data collection and analysis for audit purposes;
   - communication with clinicians about credentialling and defining the scope of practice;
   - circumstances in which a clinician's scope of practice may be altered;
   - circumstances in which a clinician's services may be suspended; and
   - appeals processes and processes for assisting clinicians to improve their performance.

2) Governance. The agency that carries out credentialling must designate an individual or a group that has the authority to:
   - develop or modify, and endorse, credentialling policies;
   - lead and oversee processes for credentialling and defining the scope of services;
   - monitor performance data; and
   - manage variations from expected performance and other problems.

   This authority may be delegated to an appropriate committee. Requirements for such a committee are:
   - a formal constitution and explicit terms of reference;
   - sufficient independence to review clinicians' performance;
   - sufficient support to function effectively; and
   - linkage to both the organisation's executive and its safety and quality-improvement mechanisms.

3) Mechanisms for assessing and reviewing clinical need. This refers to the need for specific clinical services, procedures or other interventions, taking account of benefits to patients, community needs and, in some circumstances, the distribution of related services. Thus, for example, a radiologist may not need to carry out a particular procedure if it has been superseded by new, superior technology; and a public hospital radiologist may not need to provide a particularly complex, high-cost service if another hospital nearby provides that service. Clinical need is reviewed from time to time, and may change with advancing knowledge or technology, demographic shifts, and the changing distribution of related services.

4) Mechanisms for assuring organisational capability. This refers to the availability of facilities, infrastructure and clinical and non-clinical support services that are essential for the provision of specific clinical services, procedures or other interventions. Whether the 'organisation' that provides for these requirements is a public-sector health service, a health service corporation or a private practice, its capability to support the credentialled scope of services must be reviewed on a regular basis and updated as required.

5) Recruitment processes. Organisations that employ radiologists can make use of the recruitment process as a credentialling step, by setting selection criteria that specify the required credentials and scope of practice, taking account of clinical need and organisational capability.

6) Processes for credentialling the existing clinical workforce. When credentialling is first introduced, there is a need to develop policies and define processes for credentialling and delineating the scope of practice of the existing clinical workforce. Sensitive and comprehensive communication of these policies and processes to affected clinicians is obviously most important. Consideration should also be given to the steps required if clinical services, or indeed credentialling policies and processes themselves, change substantially in ways that affect the existing clinical workforce (e.g. as a consequence of the introduction of new technology).

7) Contracts of employment or engagement for individual clinicians. For radiologists employed by health services or corporate practices, the contract of employment may specify the employing organisation's and the clinician's responsibilities with respect to credentialling, organisational capability, scope of practice, performance audit requirements, details of re-credentialling processes, and processes to be followed if variations from expected performance occur. If an agency such as the RANZCR undertakes credentialling for self-employed (and possibly employed) radiologists, membership or fellowship conditions may specify credentialling requirements.

8) Data collection and analysis systems. Credentialling depends upon the collection of data on specified clinical services, procedures or other interventions, and on defined performance indicators (as discussed in section 3.6). Data-collection systems can be designed to cause minimal disruption to busy clinicians. Under the provisions of existing privacy legislation and clinical quality-assurance legislation, the data can be collected and recorded with due regard for the privacy and confidentiality of patients and clinicians, and cannot be obtained under subpoena for use as evidence in a court of law. Data analysis is directed towards generating a summary of individual clinicians' performance with respect to:
    - the services that they provide and procedures and other interventions that they carry out;
    - the extent to which their clinical activity follows standards and recommended practice; and
    - selected outcomes.

9) Processes for the regular review of clinicians' adherence to agreed standards of practice and their performance. The review includes current professional registration, continuing professional development activities, and the results of analysis of audit data described in point (8) above. It is conducted in consultation with individual clinicians, and may lead to either re-credentialling or a request for explanation of variations from expected practice.

10) Management of changes to the scope of practice, suspension, remediation and appeals processes. Credentialling systems conducted by employers include defined processes by

which a clinician who does not provide a satisfactory explanation of variations from expected practice can have his or her scope of practice changed or can be suspended from practice altogether. Credentialling systems also include defined appeals processes. A clinician's scope of practice may also be changed if there is a change in clinical need or organisational capability, independent of the clinician's performance. A credentialling system conducted by an external agency such as the RANZCR has limited means to exert an influence on the practice of a self-employed radiologist in response to adverse findings from a credentialling process, unless arrangements can be made for the credentialling outcomes to be included in requirements for continuing eligibility for payment of Medicare benefits at specialist level. As far as we are aware, no precedents exist for this.

2.5 Situations in which credentialling is done

2.5.1 Clinicians employed in a health-care organisation

Currently, credentialling is undertaken in five types of situations:

1) when clinicians are newly appointed to a health-care organisation;
2) when credentialling is introduced, covering clinicians who have been working in but have not previously been credentialled by the health-care organisation;
3) in the regular performance review of clinicians who have previously been credentialled within the health-care organisation (this is known as 're-credentialling');
4) when clinicians (who have previously been credentialled) seek or are required to change their roles in the health-care organisation; and
5) when clinicians (who have previously been credentialled) seek or are required to perform new procedures.

New appointments

For employed radiologists, credentialling can be linked to recruitment processes. Organisational need and capacity dictate the required scope of practice. The job description and selection criteria reflect the scope of practice, and the selection criteria represent the credentials that the successful applicant must have. Qualifications and professional registration are verified with the relevant agencies. The competence and professional standing of the appointee are verified with previous employers and referees, and declared attainments such as research grants and publications are checked. Importantly, the new appointee must be inducted into the credentialling system, and be given a fair opportunity to negotiate the details of his or her scope of practice, requirements for performance monitoring, probationary period, and expectations with regard to re-credentialling (see below).

New credentialling systems

With increasing pressures to improve and account for clinical safety and quality, many health-care institutions are likely to introduce new credentialling systems or tighten existing systems. In many situations, new credentialling systems will have the potential to affect the professional standing or livelihood of the existing clinical workforce. At the very least, new systems are

likely to impose a need for additional documentation and formal performance review. Like new appointees, existing staff who participate in a new credentialling system must be inducted into it and given a fair opportunity to negotiate the details of their scope of practice, requirements for performance monitoring, and expectations with regard to re-credentialling (see below).

Re-credentialling

Credentialling and defining the scope of practice usually refer to a fixed period of time, typically three to five years[1, 10,11], after which the currency of a clinician's credentials are re-checked and performance data (collected through audit processes) are assessed in the context of ongoing organisational need and capability and technological developments. Staff participating in the credentialling system must be aware of and prepared for re-credentialling requirements.

Changing roles

Credentialling processes are invoked when clinicians (who have previously been credentialled) seek or are required to change their roles in the health-care organisation. Clinicians may themselves seek to change their roles, e.g. limit practice to a particular field or concentrate on particular techniques for a variety of reasons, including the effect of advancing age on clinical skills. Health-care organisations may require clinicians to change their roles in response to changes in organisational need or capability, technological developments, or community need. Under these circumstances, credentialling agreements must be altered.

New procedures or imaging modalities

A special case of role change arises when clinicians (who have previously been credentialled) seek or are required to perform new interventions, such as new procedures or (in radiology) a new imaging modality. The new interventions may either be innovative and result from new technological developments, or they may be established interventions that are used elsewhere but have not previously been undertaken in the health-care organisation concerned. The new interventions may involve the use of new types of equipment, new operative techniques, or the use of new substances that have significant potential to cause harm and therefore demand special skills. General guidelines exist for the introduction of new procedures.[12] Of course, the introduction of a new intervention should be preceded by evaluation, demonstration of community and organisational need for it, and confirmation of organisational capability to deliver it. In principle, credentialling processes cover the capacity of individual clinicians to carry out the new intervention, including training and relevant experience, as well as arrangements for monitoring the volume of patients receiving it and their clinical outcomes. However, radiology is a very rapidly changing field, and radiologists are constantly required to adapt their existing skills to new techniques and new equipment. It is not feasible or appropriate to expect them to be recredentialled every time a technological development or process improvement is introduced.

Radiologists often have to teach themselves how to use new techniques or equipment because there is no one who has the expertise to teach them. In these circumstances it is desirable for radiologists to undertake one or more of the following approaches to assure competence:

- careful review of relevant anatomy and physiology;
- case review;
- consultation of colleagues; and
- actively seeking clinical feedback.

2.5.2 Self-employed clinicians

For self-employed clinicians who do not have a role in a health-care organisation, e.g. as visiting medical officers or part-time sessional medical staff, we have not found any Australian precedents exist for the formal comprehensive credentialling (as distinct from CPD requirements). This includes self-employed clinicians who work as partners, associates or licensees in group practices. If an agency such as the RANZCR were to establish a credentialling system, credentialling would be undertaken in situations analogous to those listed in section 2.5.1. Again, five situations can be envisaged.

- When radiologists commence independent practice, either as newly-qualified specialists or on entry to independent practice after a period of corporate or other employed practice.
- When the credentialling system is introduced or substantially changed.
- Periodic re-credentialling.
- When the nature of independent practice is changed, e.g. moving from a city practice with ready access to collegial interactions to a relatively isolated practice in a country town.
- When new procedures or imaging modalities are adopted, either because of an expansion or shift of the radiologist's scope of practice, or because of the introduction of new imaging or interventional technology.

Some overlap exists between the last two situations.

2.6 Principles of credentialling - summary

The definitions given in sections 2.1-2.3 and the implementation processes described in sections 2.4 and 2.5 reflect five general principles of credentialling:[13]

I. Qualifications and skills: All radiologists with independent responsibility for patient care should have demonstrable, verified qualifications and skills appropriate to their roles and to the context in which care is delivered.

II. Safety: Is the radiologist qualified and competent, and are the necessary supports in place, to conduct the proposed practice?

III. Fairness: Is the decision based on objective criteria of qualification, service support and service need? Has the radiologist had a fair hearing within the credentialling framework?

IV. Accountability: Are the credentialling system, its criteria and its decisions open to scrutiny? Is the system confidential and efficient?

V. Interface with related policies: Is the credentialling system compatible with the requirements of the professional registration, performance review, equal employment opportunity, service planning, workforce planning, risk management and quality assurance?

3 Review of credentialling systems in radiology in Australia and internationally

3.1 Overview

In this chapter we review existing systems and arrangements relevant to the credentialling of radiologists in Australia and internationally.

Models of credentialling of radiologists demonstrate two approaches:

- credentialling based on radiologists' level of training, and
- credentialling for specific imaging procedures, imaging modalities or imaging technologies.

We describe both of these approaches with reference to credentialling and analogous processes in Australia, the USA, Europe, the UK and New Zealand. We conclude by examining the types of indicators used for measuring the performance of radiologists in credentialling systems.

3.2 Australian credentialling systems

3.2.1 Radiology Memorandum of Understanding and its implications for credentialling

In 2003, the Australian Government Minister for Health and Ageing signed an agreement on the delivery and remuneration of radiology services with the RANZCR and the Australian Diagnostic Imaging Association (ADIA). The agreement is known as the *Radiology Quality and Outlays Memorandum of Understanding* (MoU)[14]. The purpose of the MoU, which covers the five-year period to 30 June 2008, is:

> '…to promote
> a) Access to quality, affordable Radiology services;
> b) Effective management of outlays by the Commonwealth for…Radiology services…;
> c) Improvement in the quality and delivery of Radiology services through the development of a quality framework; and
> d) Co-operative strategies which promote affordability of services for patients.'

The MoU applies to Medicare funding of diagnostic radiology, including X-ray, CT, ultrasound and MRI services. It excludes cardiac ultrasound and angiography, obstetric and gynaecological ultrasound, and nuclear medicine, which are the subjects of separate Quality and Outlays Memoranda of Understanding. Like the others, the Radiology MoU specifies a maximum annual outlay on the included services, allowing for year-to-year variation and for the effects of new technology on service delivery.

A Radiology Management Committee has been established to manage the implementation of the MoU and advise the Minister on policy issues pertaining to radiology services. The Management Committee comprises representatives of the Department of Health and Ageing, the RANZCR and the ADIA. It is responsible, *inter alia*, for determining:

> '…the extent and nature of a program of quality and research which will include as a priority the following:
> a) promoting quality assurance and accreditation with mandatory accreditation of radiology practices, linked to Medicare Benefits, by November 2005 with appropriate transitional arrangements;
> b) working cooperatively with other providers of Radiology services to develop a uniform set of standards for accreditation of all practices that provide Radiology services, with a view to moving to consistent regulatory arrangements across all provider groups;
> c) best practice education campaigns targeted to both providers and requestors;
> d) discrete education projects for providers and consumers, promoting quality referral practices to reduce inappropriate services;
> e) facilitating the management of new technologies, including teleradiology;
> f) examining the role of current professional supervision requirements; and
> g) investigating roles and standards for non-medical diagnostic imaging professionals.'

The MoU thus makes an explicit commitment to *accreditation of radiology practices*. It does not, however, make any explicit reference to *credentialling of radiologists*, although 'promoting quality assurance' and 'examining the role of current professional supervision requirements' have obvious implications for credentialling. To date, the MoU has not stimulated the development of credentialling of radiologists. However, any initiatives by the radiology profession to develop credentialling should recognise the requirements and priorities given in the MoU.

3.2.2 Accreditation and its overlap with credentialling

The RANZR has developed a set of minimum Practice Standards for diagnostic imaging and interventional radiology in Australia[15]. These standards are presently used (in conjunction with ISO 17025) to *accredit radiology practices* through the RANZCR/NATA Accreditation Program. They potentially cover professional, technical and administrative aspects of practice in public- and private-sector settings, the latter including corporate and independent practices.

NATA identifies the three benefits of accreditation[16] as being a benchmark for performance, a marketing advantage and formal recognition, based on a primary orientation towards technical operations and safety:

> 'NATA accreditation benefits…facilities by allowing them to determine whether they are performing their work correctly and to appropriate standards, and provides them with a benchmark for maintaining that competence. Many such facilities operate in isolation to their peers, and rarely, if ever, receive any independent technical evaluation as a measure of their performance. A regular NATA audit checks all aspects of a facility's operations related to consistently producing accurate and dependable data. Areas for improvement are identified and discussed, and a detailed report provided at the end of each visit. Where necessary, follow-up

> action is monitored by NATA so the facility is confident that it has taken the appropriate corrective action…NATA accredited testing facilities are able to advertise their accreditation on their test certificates and in general advertising, especially through the use of the well-known NATA logo, since such accreditation is highly regarded both nationally and internationally as a reliable indicator of technical competence'.

The Standards describe the minimum training, registration and practice requirements for radiologists and other staff employed within an accredited practice. The Standards also encompass minimum equipment and safety requirements for:

- each imaging modality;
- sedation, anaesthesia and resuscitation;
- infection control;
- environmental waste management and hazardous materials;
- imaging procedure manuals and documentation;
- digital image data management; and
- administration within accredited practices.

While the Standards are used in the context of accreditation, they cover several items that are relevant to credentialling. Examples are radiologists' qualifications; CPD requirements; requests (i.e. referrals to radiologists); additional and substituted tests (other than those requested); supervision requirements; provision of sedation and anaesthesia; and standards referring to specific procedures such as carotid angioplasty and stenting[17].

The accreditation process has three stages. Stages 1 and 2 involve registration and Stage 3 involves accreditation, a site visit and a document review. Despite the intent expressed in the 2003 Radiology Quality and Outlays MoU[14] to mandate accreditation of radiology practices by November 2005 (described in section 3.2.1), only a small number of practices had completed Stage 3 of the accreditation process by the beginning of 2006. From our consultations, and as reported in a review commissioned by the RANZCR Quality Use of Diagnostic Imaging (QUDI) program, the principals of corporate and independent radiology practices have indicated that they have found the RANZCR/NATA accreditation process to be time-consuming and costly to execute. The Australian Government has announced that it is introducing an accreditation scheme for medical practices that provide radiology services covered by Medicare. The proposed commencement date of the scheme is 1 September 2007[18]. It is understood that the Australian Government is intending to consult as to whether the scheme should use a single accreditation provider such as NATA, or multiple providers.

Although, as explained above, there is some overlap with credentialling, the RANZCR/NATA accreditation process does not cover many of the components of credentialling outlined in Chapter 2. It concentrates on the operation and maintenance of radiology facilities, giving particular attention to issues such as radiation safety. It does not incorporate credentialling, but stipulates baseline qualifications and specific requirements for radiologists working in different modalities.

3.2.3 Credentialling in interventional radiology

As outlined in section 1.2.5, the training requirements for Fellowship of the RANZCR include basic interventional radiology. The RANZCR stipulates a requirement for all graduating Fellows to be competent in basic interventional procedures, but highlights the importance of additional training for the more complex procedures.

The Interventional Radiology Society of Australia (IRSA) has specified two tiers of interventional radiology, described in its *Guidelines for Credentialling for Interventional Radiology* . The two tiers are called Tier A and Tier B.

- Tier A comprises basic diagnostic angiography and basic interventional techniques for angiography, nephrostomy, abscess drainage and biopsy. The *Guidelines* state that

  > 'This is in keeping with the training requirements of the RANZCR and any individual with RANZCR or equivalent qualifications may perform these procedures.'

- Tier B lists the procedures for which radiologists who have subspecialised in interventional radiology may be credentialled. These fall into the following nine groups:

  1. All neuro-interventional procedures intracranial and extracranial.
  2. All vascular interventional procedures other than basic diagnostic angiography, i.e. stents, angioplasty, thrombolysis, thrombectomy, atherectomy, embolisation, retrieval of foreign bodies and laser and mechanical angioplasty.
  3. Venous and arterio-venous graft interventions other than basic diagnostic venography or fistulography, i.e. thrombolysis, angioplasty, stents, atherectomy, pulmonary embolectomy/ thrombolysis and caval filter insertion.
  4. Biliary intervention…
  5. Thoracic interventions, i.e. embolisation of …[arterio-venous malformations], bronchial stents, occlusion of bronchopleural fistulae and bronchial artery embolisation.
  6. Gastro-intestinal intervention, i.e. oesophageal and duodenal stents, percutaneous gastrostomy, gastrointestinal vascular procedures other than diagnostic angiography, i.e. embolisation, chemo-embolisation and transplant intervention.
  7. Urological intervention, i.e. renal artery embolisation, angioplasty or stenting, percutaneous nephrolithotomy.
  8. Gynaecological – fallopian tube recanalisation, embolisation of fibroids, temporary aortic occlusion (*sic*).
  9. Orthopaedic – percutaneous vertebroplasty, percutaneous discectomy.

  The *Guidelines* stipulate minimum training requirements for Tier B in terms of the numbers of procedures to be performed and the numbers of procedures as primary operator. The *Guidelines* require 'proof of quality' for continuing credentialling. 'Proof of quality' is denoted by a series of indicators of success or complication rates, based on an 'intention to treat'. Examples of success indicators are success of diagnostic accuracy (95%), success in crossing stenosis (95%), and success in renal stent placement (80%). Examples of complication indicators and threshold rates are failure to obtain percutaneous access (required open procedure) (<1%), puncture site haematoma (requiring surgery, transfusion

or delayed discharge) (<3%), contrast extravasation (<1%), distal embolisation (<0.5%), and dissection or occlusion of vessels (<2%).

The IRSA has developed a database that can be used by members to log procedures and their outcomes. It can automatically generate cumulative reports on an interventional radiologist's performance with respect to the indicators (personal communication, Dr James Burnes). This enables the radiologist to self-monitor on an ongoing basis and easily fulfil reporting requirements for re-credentialling.

In addition to procedural performance, the IRSA specifies standards of equipment for interventional radiologists. For example[2]:

> 'Over 75% of the procedures required for training must be performed in a dedicated angiography suite. Mobile image intensifiers are not considered in the interests of the patient or the operator.'

While the *Guidelines* provide an approach to credentialling that is unique in Australian radiology practice, they do not reflect the rigorous processes described in the generic national *Standard for Credentialling and Defining the Scope of Clinical Practice*[1]. For example, the *Guidelines* do not specify who is responsible for credentialling, how re-credentialling is to be done, or what action is to be taken if an interventional radiologist does not fulfil the stipulated rates given for the success and complication indicators.

3.2.4 Credentialling in nuclear medicine

In September 2000, the (then) Commonwealth Department of Health and Aged Care determined that a Register of Credentialled Specialists in Nuclear Medicine should be established. A Joint Nuclear Medicine Specialist Credentialling Program was developed under the auspices of the RACP and the RANZCR. The Program is administered on behalf of the Colleges by the Australian and New Zealand Association of Physicians in Nuclear Medicine (ANZAPNM). The purpose of the Register is to allow the Health Insurance Commission to identify those physicians in nuclear medicine whose patients are eligible to receive Medicare rebates at the specialist level[19].

The Credentialling Program is based on the standards outlined in Principle 1 of the Standards for Accreditation of Nuclear Medicine Practices, issued in November 2000[20]. Principle 1 states that:

> 'Each nuclear medicine service shall be performed by a qualified specialist in nuclear medicine who is responsible for performing procedures in the best interest of the patient.'

The standards cover:

1) Training in nuclear medicine, supervised and assessed by the Joint Specialist Advisory Committee in Nuclear Medicine of the RACP and the RANZCR.
2) A current licence from the appropriate radiation licensing body to prescribe and administer radioactive substances to humans.

3) Personal supervision: the physician in nuclear medicine must be physically present at the practice location to attend the patient personally, determine the appropriateness of the procedures, monitor the quality of the procedure and provide a final consultation report.
4) Nuclear medicine therapy: if the physician in nuclear medicine intends to undertake therapy with unsealed sources, specific requirements must be made with regard to qualifications and experience, a current licence for unsealed-source therapy, the facilities and procedures for treatment, and the availability of a radiation safety officer.
5) Responsibilities of the specialist: the physician in nuclear medicine is responsible for the safety and quality of all procedures performed under his or her supervision.
6) Continuing education activities: The physician in nuclear medicine should maintain detailed records of continuing education activities that are undertaken.
7) Education of other practitioners: The physician in nuclear medicine should contribute to the education of other practitioners and health professionals about the clinical application of nuclear medicine procedures.
8) Quality assurance: The physician in nuclear medicine is responsible for ensuring that appropriate procedures are carried out, including quality control of instruments, procedures and radio-pharmaceuticals.

To complete the credentialling process, physicians in nuclear medicine are required to complete a simple one-page form and submit it to the Secretariat of the Joint Nuclear Medicine Credentialling and Accreditation Committee (JNMCAC). The form requires the practitioner to give a Provider Number for nuclear medicine services and the address to which it relates, and to tick a 'yes' box in response to the following statements:

> 'Training in Nuclear Medicine. I am recognised as a specialist in nuclear medicine by the Specialist Recognition Advisory Committee in my jurisdiction.
> Licence to Use Radioactive Substances. I hold a current licence to prescribe and administer radioactive substances to humans from the State radiation licensing body.
> Personal Supervision. I will provide personal supervision for all nuclear medicine imaging procedures for which I am responsible in accordance with requirements listed in the document 'Standards for Accreditation of Nuclear Medicine Practices – November 2000'.
> Responsibilities of the Specialist. I am responsible for the quality and safety of all procedures performed by nuclear medicine personnel which I supervise at the facility of facilities.
> CME. I am enrolled in the relevant continuing medical education program of the appropriate College [RACP or RANZCR].
> Quality Assurance. I am responsible for ensuring that appropriate practice quality assurance and control procedures are carried out.'

Re-credentialling of those credentialled when the arrangements were introduced was required in 2004, and is required every three years thereafter[19]. Thus, the credentialling and re-credentialling processes do not contain any requirement to assess the performance of the physician in nuclear medicine, either at the outset or on a periodic basis.

Arrangements for the credentialling of physicians in nuclear medicine are noteworthy in connection with the credentialling of radiologists because they:

- involve the RANZCR in the definition of standards of practice;

- illustrate the relationship between standards for accreditation of practices and standards for the credentialling of practitioners; and
- represent an example of credentialling that is conducted by a professional organisation – the Joint Nuclear Medicine Credentialling and Accreditation Committee – rather than an employer.

3.2.5 Credentialling of MRI supervising radiologists

As described in section 1.2.6, MRI supervising radiologists are required to accumulate a total of 60 CPD points in MRI-related topics (across any of the CPD activity groups described). The RANZCR has recently reduced the MRI CPD requirement from 90 points in the triennium.

A register of MRI supervising radiologists is maintained by the College.

Additionally, practices providing Medicare-funded MRI services are required to participate in the MRI component of the RANZCR's Quality and Accreditation Program as a condition of their recognition by Medicare.

Radiologists who provide MRI services on eligible machines are required to make a Statutory Declaration to Medicare that they are specialists in diagnostic radiology, and are a participant in the RANZCR Quality and Accreditation Program.

3.2.6 Performance review at institutional level

Some individual institutions conduct structured performance reviews of individual clinicians. For example, the Peter MacCallum Cancer Centre in Melbourne requires individual radiologists to carry out a self-appraisal on an annual basis. Radiologists fill in a form in which they rate their achievement on some 56 criteria using a set form. A similar approach is taken by the Department of Radiology at St Vincent's Hospital, Melbourne. The criteria, which are described in detail in the form, encompass:

- Clinical skills (e.g. safety, clinical competence)
- Workload and time management
- Participation in multi-disciplinary care
- Fulfilment of registration and licensing requirements
- Completion of RANZCR CPD requirements
- Supervision of trainees
- Maintenance of records, including statistics on activity
- Involvement in quality improvement
- Collegial behaviour
- Participation in professional committees and forums
- Involvement in research
- Teaching
- Membership of academic committees

- Attendances and presentations at conferences.

The radiologist discusses his or her completed form with the Director of Radiology, who assesses the individual's performance against the criteria and the individual's employment contract[21].

3.3 Credentialling of radiologists in the USA

3.3.1 Agencies relevant to credentialling

At least six agencies in the USA are involved in processes relevant to the credentialling of radiologists[22]. These are:

- American Board of Medical Specialties. This is the umbrella body of American specialty boards, representing 24 medical specialties, including the American Board of Radiology.
- American Board of Radiology (ABR). The ABR is the specialty board for radiology. Its primary purpose is to test and certify radiologists. It administers examinations and certifies radiology trainees.
- American College of Radiology (ACR). This develops standards of practice for radiology. It does not accredit training programs and does not certify individuals.
- Accreditation Council for Graduate Medical Education (ACGME). This oversees the accreditation of training schemes in various specialties, including residency programs.
- Accreditation Council for Continuing Medical Education. This oversees CME programs of various specialties, and allocates CME points to societies and conferences.
- Joint Commission on Accreditation of Health Care Organizations (JCAHO). Accreditation requirements set by the JCAHO include credentialling criteria for re-appointment of practitioners to health-care organisations.

The ABR is of fundamental importance to credentialling processes as it provides both basic and subspecialty certification for practice as a radiologist in the USA. It conducts examinations for trainee radiologists, including initial examinations in diagnostic radiology and advanced examinations in the subspecialties of neuroradiology, nuclear radiology, paediatric radiology, and vascular and interventional radiology[23]. There has been a move in the USA to only provide Medicare/Medicaid rebates to radiologists and technologists who are registered to perform a particular imaging procedure[24].

The ABR has introduced a ten-year 'maintenance of certification' (MOC) program for all newly-certified radiologists. Radiologists with long-standing certification are also encouraged to participate[25]. The MOC has four components (professional standing; lifelong learning and self-assessment; cognitive assessment; and assessment of performance in practice) and covers six competencies (medical knowledge; patient care; interpersonal and communication skills; professionalism; practice-based learning and improvement; and systems-based learning). Participants must maintain their license to practice, accumulate a minimum of 500 approved CME credit hours, undertake self-assessment modules and a cognitive examination, and participate in the ABR's Practice Quality Improvement Program.

The ACR, which has more than 30,000 members, is the principal US professional society of radiologists, radiation oncologists and clinical medical physicists. Its primary purposes are:

> 'to advance the science of radiology, improve radiologic services to the patient, study the socioeconomic aspects of the practice of radiology, and encourage continuing education for radiologists, radiation oncologists, medical physicists, and persons practicing in allied professional fields.'

The ACR has produced some 130 guidelines in the following categories:

- Continuing medical education
- General diagnostic radiology
- Breast imaging and intervention
- Interventional radiology
- Medical Physics
- Nuclear medicine
- Radiation oncology
- Ultrasound
- Ordering information.

Within the general diagnostic radiology rubric, there are six subcategories:

- Neuroradiology/ head and neck
- Musculoskeletal
- Chest
- Cardiovascular
- Abdomen/gastro-intestinal
- Genito-urinary

Each guideline, although quite brief, is comprehensive. An example is the *ACR Practice Guideline for the Performance of Radiography of the Extremities*, which is one of the musculoskeletal guidelines. It lists indications, refers to qualifications and responsibilities of personnel, describes requirements for physical examination and documentation, specifies equipment, and outlines expectations for quality control and quality improvement, safety, infection control and patient education.

3.3.2 Credentialling and clinical privileges

As long ago as 1983, the *Journal of the American Medical Association* published a description of how radiologists were credentialled in the Department of Radiology, University of California Davis School of Medicine and Medical Center, Sacramento. The Davis approach was based on three categories of 'clinical privileges' (i.e. three scope-of-practice categories)[26].

- Category I applied to practitioners who had completed radiology training in an accredited program but had not been certified by the American Board of Radiology (ABR) and had not received training in a subspecialty area. Those with Category I privileges could practice only under supervision.
- Category II applied to radiologists who were certified by the ABR or its equivalent but had not received fellowship training in a subspecialty area such as neuroradiology. Those given

Category II privileges could undertake general diagnostic radiology independently but could perform subspecialty procedures only under supervision.

- Category III applied to radiologists who had received specialty board certification from the ABR or its equivalent and were practising in a subspecialty area such as neuroradiology. Subspecialty practice required completion of a fellowship program as well as board certification.

The US Accreditation Council for Graduate Medical Education (ACGME)[27] has set out requirements for practice in core areas of radiology (analogous to Category II in the Davis system) and practice in subspecialty areas (analogous to Category III). It has identified minimum formal training and experience requirements for consideration of credentialling for practice in the core areas, and suggested that threshold criteria must be established for each subspecialty area.

Little detail is available on the processes followed by the ACGME, either for initial credentialling or for re-credentialling process. The ACGME states that:

> 'Reappointment should be based on unbiased, objective results of care according to the organization's existing quality assurance mechanisms. Applicants must be able to demonstrate that they have maintained competence by showing that they have performed and/or interpreted at least 1,000 radiologic tests annually over the reappointment cycle. In addition, continuing education related to radiology should be required.'

Other US credentialling systems in radiology are specific for particular modalities. For example, the Society for Cardiovascular Magnetic Resonance has developed guidelines for credentialling in cardiovascular MRI[28]. The guidelines are broad-based and can be used to credential practitioners from a variety of medical backgrounds, particularly radiology, nuclear medicine and cardiology. They were developed to be used by credentialling committees of healthcare facilities and agencies in the USA. The credentialling system has three levels.

- Level 1 gives recommendations for basic training in cardiovascular MRI for radiology, nuclear medicine and cardiology. The intent is familiarisation with cardiovascular MRI rather than preparation for practice.
- Level 2 comprises general and specific criteria for credentialling in the practice of cardiovascular MRI. General criteria include eligibility for board certification in radiology, nuclear medicine or cardiology, and training and experience in at least one other cardiac imaging modality. Specific criteria include at least three months' full-time training in cardiovascular MRI, completion of comprehensive coursework, supervised interpretation of at least 150 cardiac and vascular MRI studies representing the range of abnormalities observed in practice, ACGME-approved CME, and primary interpretation of at least 50 cases a year.
- Level 3 requires the general criteria of Level 2, plus one year of full-time training in cardiovascular MRI, supervised interpretation of at least 300 cardiovascular MRI studies, participation in the quality assurance program of the facility in which the candidate is working, ACGME-approved CME, and primary interpretation of at least 100 cases a year.

3.3.3 Implications for Australia

The accreditation system conducted by the ABR is undoubtedly a model that should be examined carefully with regard to potential adaptation for Australia.

The multiplicity of US systems that relate to credentialling is also a lesson for Australia. It is desirable for any credentialling system to avoid fragmentation across a multiplicity of interest groups with separate requirements, even if they are motivated by an earnest intent to promote the credibility and quality of the procedures that they champion. Such fragmentation can only create bewilderment and unnecessary complexity.

3.4 Credentialling of radiologists in Europe and the UK

The European Association of Radiology (EAR) has summarised the context of credentialling, highlighting the need for public accountability[29]:

> 'There is increasing demand for public accountability of doctors. Some European countries have created public agencies to review hospital standards and national medical regulating bodies have increased their involvement in setting and monitoring the standards of care of doctors. The medical profession in Europe is regulated primarily by its own members and this self-regulation is based upon the premise that practice and performance of medicine can only be adequately reviewed by those with expertise in the field. However, patients are increasingly involved in decision-making and patient groups and government bodies in the assessment of performance and thus indirectly in regulation. It is therefore important that radiologists define criteria for good radiological practice in order to emphasise to these outside bodies that clear standards are being set down by the profession and that regulation is being performed against transparent criteria.'

The EAR has provided a useful checklist of the components of good radiological practice:

- An adequate assessment of the patient's condition and of the complaint to be investigated, based on information from the referring clinician and the patient.
- Arranging and providing appropriate investigations that 'minimise risk and maximise the clinical efficacy of diagnosis.'
- Ensuring that an appropriate assessment of the images is made, that a timely report is issued and that prompt action is taken where indicated.
- The need for individual radiologists to recognise the limits of their professional competence, particularly in respect of their experience in particular imaging modalities, their skill and detailed knowledge of particular subspecialties, and their skill and experience in interventional techniques.
- Competence in making a diagnosis or arranging treatment, keeping clinical colleagues well informed, and sharing responsibility effectively with fellow clinicians.
- Providing an accurate, explicit and understandable written radiological report, recording the relevant findings and providing clear guidance to the referring clinician on the likely diagnosis, on any uncertainty about interpretation, and on recommended supplementary investigations.

- Rapid communication as an adjunct to the written radiological report in clinical emergency situations.
- When prescribing drugs or treatment, an adequate knowledge of the patient's medical history, medications and health needs, and of the benefits and complications of the substances used.
- Appropriate and efficient use of resources.
- Ensuring that a quality assurance system is in place for equipment, with regard to image quality, maintenance, upgrades and radiation dose.
- Ensuring safety and adequacy of equipment and facilities – or electing not to undertake a procedure.
- Giving priority to investigation and treatment of patients on the basis of clinical need.

The EAR also emphasises the need for radiologists to develop and maintain their expertise through continuing education, participation in clinico-radiological meetings and regular systematic audit. In conjunction with the Radiology Section and Board of the Union Européenne des Medicins Specialists (UEMS), EAR has issued a detailed policy and guidelines on the organisation of CME and CPD and the reporting of CME and CPD credits[30].

Importantly, the EAR highlights the multi-disciplinary nature of radiological services and the radiologist's role and responsibilities within a team.

> 'Radiological diagnosis and therapy is provided by multi-disciplinary teams including radiographers, medical physicists, nurses and supported by administrative staff, but this does not change the personal accountability of the radiologist (*sic*). It is usually the responsibility of radiologists to lead the diagnostic/therapeutic team. The radiologist working in a team must respect the skills and contribution of colleagues and maintain good communications between members of the team…Radiologists must ensure that all team members understand their personal and collective responsibility for the safety of the patient and the team objectives, tasks and responsibilities. The radiologist must ensure, where…[a] delegate is providing…care on the radiologist's behalf, that the person to whom the task is delegated is competent to carry out the procedure or provide the therapy involved.'

In the UK, the Royal College of Radiologists (RCR) uses the term 'appraisal' similarly to our use of 'credentialling'. The RCR describes appraisal as an essential component of clinical governance, which is defined as 'a corporate accountability for clinical performance'[31],[32] defined appraisal as:

> '…the use of systematic methods regularly to review the work of senior hospital doctors. It is an inclusive term. Appraisal is only appropriate and meaningful if it includes both the clinical and non-clinical aspects of a doctor's work, and if it focuses both on the performance of individuals and on the performance of units and departments in which they work.'

Appraisal is envisaged as an annual process. It is intended that annual appraisal reports will be compiled for five years. The portfolio of five years' appraisals is then assessed independently by a Revalidation Group, members of which form a view on the doctor's fitness to practice in his or her field. Based on this assessment, the Group makes a recommendation to the General Medical Council for the doctor's continued registration as a medical practitioner in the UK[33].

Different hospitals and health services in the UK have developed different models of appraisal. For example, in Guy's and St Thomas' Hospitals, London, Clinical Directors undertake appraisal of consultants in their units, and receive training for this role. Prior to the appraisal interview, the consultant completes job plan and study leave forms, providing information which is discussed during the interview. The interview is an opportunity for the forms to be amended and for any other significant issues to be discussed by both the appraising Clinical Director and the consultant being interviewed. The appraisal is largely formative and does not involve consideration of any indicator data on the consultant's performance. By contrast, at Milton Keynes General Hospital, Buckinghamshire, the appraisal process includes both a consideration of the consultant's personal development plan and an analysis of performance data for the previous year. The individual's performance data are reviewed in the light of departmental averages, audit processes are examined, and service developments are reviewed. The information is used to formulate individuals' training needs. The Milton Keynes process also includes a '360 degree review', which takes account of the views of people other than the Clinical Director undertaking the appraisal.

The RCR has designed template audit forms for the various components of the appraisal process. These forms describe recommendations for each component, list indicators (items to be measured), suggest target levels for each indicator, specify data to be collected, and specify the sample size for data collection. If targets have been met, the date for commencing the next audit is noted. If targets have not been met, changes that are to be implemented are determined. The available templates include following:

- Basic core audit: (1) the patients' view, (2) clinical incident reporting, and (3) perceived quality of help and advice to other doctors.
- Clinical effectiveness audit: (CE1) complications in vascular radiology, (CE2) quality of radiologists' reports to general practitioners (GPs), (CE3) colorectal cancer demonstration rate in barium enemas performed by radiographers, (CE4) errors in radiology, (CE5) liver biopsy success and complication rates. (This template may not apply in Australia, where radiographers have a different role and where barium enemas as largely superseded by fibre-optic colonoscopy and colonic MRI.)
- Continuing professional development audit: (CPD1) consultant audit involvement in his/her own area of high activity or risk, (CPD2) radiographer competence in the administration of IV contrast for CT examinations, (CPD3) consultant appraisal: an assessment of personal achievement during the year, (CPD4) consultant study leave, CME, CPD and service development needs, (CPD5) assessment of staff leadership skills.
- Clinical risk management audit: (CR1) adequacy of patient consent for interventional radiological procedures, (CR2) incorrect imaging (or interventional) examinations in the radiology department, (CR3) needlestick injury, (CR4) equipment replacement program, (CR5) staff back injuries.
- Departmental organisation audit: (DO1) individual radiologist's workload, (DO2) coverage of the 'hot film' fast track reporting session, (DO3) clarity of lines of responsibility and accountability in the radiology department, (DO4) communication within the department, (DO5) the vetting of requests for an imaging examination.
- Investigative protocols audit: (IP1) CT staging of common cancers, (IP2) investigation of asymptomatic microscopic haematuria in adults, (IP3) investigation of a metastasis or

metastases from an unknown primary, (IP4) imaging of patients with acute stroke or TIAs, (IP5) imaging in symptomatic breast disease.

- Service quality audit: (SQ1) audit of complaints, (SQ2) fracture clinic radiographs: provision of films and reports, (SQ3) impact of service developments on the radiology department, (SQ4) availability of the on-call radiologist, (SQ5) reporting: GP referrals for plain film examinations.

The RCR approach is unlikely to be applicable in Australia. It requires an intensive commitment to audits, many of which are not relevant to the credentialling of general radiologists. It also tends to conflate accreditation and credentialling issues.

3.5 Credentialling of radiologists in New Zealand

In New Zealand, doctors are registered within one or more scopes of practice. A scope of practice is defined in legislation as the professional service that a doctor is permitted to perform. The Medical Council of New Zealand has defined three types of scope of practice: general, vocational and special purpose[34].

Practising radiologists hold vocational registration in diagnostic and interventional radiology. This recognises the training program of the RANZCR, with accredited training posts in Australasia, leading to Fellowship of the RANZCR. New Zealand vocationally registered diagnostic radiologists are required to participate in approved recertification programs, including CME and self-assessment activities[35].

3.6 Performance measurement in radiology

3.6.1 Characteristics of performance indicators

As described in section 2.4.3, performance indicators are an essential component of credentialling and re-credentialling processes. Ideal performance indicators should[36]:

- be evidence-based;
- reflect agreed standards;
- be reproducible;
- reflect performance that is attributable to the individual clinician;
- cover variables that occur with sufficient frequency for meaningful statistical analysis;
- cover variables that are feasible to collect.

For diagnostic radiology, it is difficult to suggest performance indicators that fulfil these criteria. Clinical outcomes that follow from diagnostic imaging are not usually communicated in a manner that can be linked to the radiological examination (see section 1.2.1). For example, if a radiologist diagnoses a tuberculous lesion on a chest X-ray, it is uncommon for the radiologist to receive feedback when the diagnosis is confirmed and the patient successfully

treated. Incorrect diagnoses may attract critical feedback, but correct diagnoses are almost never acknowledged. The measurement of diagnostic competence is therefore a great challenge. For interventional radiology, performance can be measured more easily. For example, procedure success rates (e.g. successful retrieval of biopsy tissue or successful placement of a stent) and complication rates (e.g. haematoma following renal or hepatic biopsy) can be audited.

3.6.2 The scope of performance measurement and indicators

Of course, performance measurement is not confined to indicators of clinical judgment and technical skill. As stipulated by US JCAHO, practitioner-specific data must be collected and compared with aggregate data on professionalism, communication, and continued clinical self-improvement and CME as well as clinical judgment and technical skills. The JCAHO also stipulates that reappointment of hospital staff should be contingent on satisfactory results on these parameters[37].

Reviewing errors in radiology is a common way for radiology departments to measure individual performance. There are reported examples of departments running peer review conferences which are used to discuss errors that have a significant educational value[38,39]. Usually cases are presented at peer review conferences without identifying the radiologist involved. Another approach is to enter errors into a database and compare an individual's normalised error rate with a departmental mean. Inquiries are instituted if an individual radiologist's normalised error rate is more than two standard deviations from the departmental mean[38,38]. Errors in radiology are discussed further in Chapter 4.

3.6.3 Australian examples of performance measurement in radiology

We could find few Australian examples of systematic performance measurement of radiologists.

- Teaching hospital radiology department usually conduct 'double reading' of images that are read by radiology registrars (i.e. a qualified radiologist re-read the image and checked the registrar's report). However, while 'double reading' helps to assure the safe reporting of images read by trainees and affords teaching opportunities, we could not find any instance of systematic collection of indicator data on individual registrars' performance. 'Double reading' is discussed further in Chapter 4.

- Some teaching hospitals also conduct regular clinical-radiological correlation meetings. In these meetings, radiology staff (including registrars) confer with their colleagues in medicine and surgery on diagnosis and management of recent and current cases, bringing together radiological, pathological and clinical findings. In one teaching hospital radiology department that we visited, daily correlation sessions are held, cycling through different fields of medicine and surgery (e.g. chest oncology, solid liver tumour and upper gastro-intestinal surgery cases were discussed on Mondays; cardiological cases were discussed on

Tuesdays; and so on). However, while these sessions provide an excellent forum for clinical teaching and quality improvement, we again could not find any instance of systematic data collection on the performance of individual radiologists.

- In a corporate practice that we visited, radiologists were required to report 'incidents', which ranged from minor adverse reactions following the injection of contrast media to missed diagnoses. Each 'incident' was investigated by the medical director, and the findings were translated into corporate policies and guidelines. 'Incident' reports were also required for medical indemnity insurance purposes. However, again, there was no apparent attempt to analyse the data systematically or to use the data in any credentialling process. We note that, under Australian Corporate Law, publicly-listed companies are required (under the Continuous Disclosure Listing Requirements) to notify the Australian Stock Exchange of any significant events that may affect their share prices. 'Significant events' are not defined, but they include medical incidents that may give rise to negligence claims. This creates a need for corporate radiology practices that are established within publicly-listed companies to be vigilant regarding adverse incidents or events.

- The Australian Council on Healthcare Standards (ACHS) has developed and collected data on clinical indicators across a range of medical specialties[40]. ACHS clinical indicators for radiology comprise time between investigation and report, and morbidity from radiological procedures (Box 3.1).

- As mentioned in section 3.2.3, the IRSA has developed indicators to be used in credentialling for the performance of interventional radiology.

3.6.4 Overseas examples of performance measurement in radiology

As described in section 3.4, the RCR has designed template audit forms for the various components of the appraisal process. These forms include performance indicators, suggest target levels for each indicator, specify data to be collected, and specify the sample size for data collection. Many of the performance indicators are suitable for the accreditation of a radiology service rather than the credentialling of a radiologist. An example is given in Box 3.2.

In the USA, the ACR guidelines, described in section 3.3.1, provide a basis for the development of performance indicators. For example, the *ACR Practice Guideline for the Performance of Pediatric and Adult Chest Radiography* details the required qualifications of the supervising and interpreting physician, specifies the examination in detail[41]. Thus, the *Guideline* can be taken as a standard to which performance indicators refer, but does not itself contain explicit performance indicators.

Box 3.1: ACHS radiology indicators

1. Report availability
   1.1. The rate of reports on non-procedural non-urgent plain radiographs not available to the referring clinician within 24 hours
2. Morbidity of radiological procedures
   2.1. The rate of patients undergoing cerebral angioplasty having documented evidence of a temporary neurological deficit following the procedure
   2.2. The rate of patients undergoing cerebral angioplasty having documented evidence of stroke within 24 hours of the procedure
   2.3. The rate of patients undergoing cerebral angioplasty who die following the procedure
   2.4. The rate of patients undergoing percutaneous trans pleural biopsy of the lung mediastinum, having documented evidence of pneumothorax and/or haemothorax requiring intervention following the procedure.

Box 3.2: Example of a RCR clinical effectiveness audit performance indicator: complications in diagnostic vascular radiology

Background: The audit is worth carrying out because all angiographic vascular procedures are associated with a potential morbidity. Doctors have a duty to monitor their own performance. Whenever possible, local performance should be compared against an explicit standard based on authoritative recommendations.

Organisation and delivery: Organising this audit and delivering this report are the responsibility of the consultant radiologist(s) responsible for the provision of diagnostic and interventional vascular procedures.

The cycle:

1 The standard is as follows.

1.1 Recommendation: Complication rates should not exceed the following for diagnostic vascular procedures (angiography). At the puncture site: haematoma (requiring transfusion/surgery or causing delayed discharge) – 3.0 percent; occlusion of a vessel – 0.5 percent; pseudo-aneurysm – 0.5 percent; A-V fistula – 0.1 percent. Non-puncture site: distal embolism causing tissue damage – 0.5 percent; unintended occlusion of a selected vessel – 2.0 percent.

1.2 Indicator: Percentage of complications occurring for each procedure.

1.3 Targets: the percentages quoted above should not be exceeded.

2 Assess local practice.

2.1 Data collection requirements: Records of the diagnostic vascular procedures performed. Details of all the recorded/recognised complications listed above.

2.2 Sample size: All diagnostic vascular procedures performed during a one-year period.

2.3 This sample has been chosen because: Monitoring of vascular complications should be part of a continuous audit.

Source: adapted from de Lacey G, Godwin R, Manhire A (eds)

4 The need for credentialling in radiology

4.1 Overview

The intent of credentialling is to improve the safety and quality of radiology services by:

- verifying that radiologists have the training, skills, expertise and professional attributes to fulfil their responsibilities,
- indicating the extent to which they meet accepted standards of practice;
- monitoring their performance, and providing constructive feedback and, where needed, remediation; and
- monitoring their participation in continuing education and professional development.

By defining roles, responsibilities and standards, credentialling can help to ensure that radiologists are appropriately trained to adopt new techniques and use new types of technology. It can also help to ensure that they keep abreast of new knowledge in fields of medicine relevant to their imaging practice, thereby strengthening their capacity to provide expert advice on clinical problems and to undertake the most effective image-guided interventions.

The explicit nature of the credentialling process and its associated documentation help to meet contemporary expectations of accountability. As highlighted by the EAR (section 3.4), the medical profession's tradition of self-monitoring and self-regulation can be upheld only if there are clear standards of practice and transparent criteria for evaluation of performance against these standards. Credentialling systems are being developed and implemented in an increasing number of fields, such as surgery and oncology[42]. It is inevitable that, where radiologists perform procedures similar to those performed by credentialled specialists from other disciplines (e.g. endovascular surgery), radiologists will need to be able to show evidence of equivalent or superior expertise. Credentialling systems can produce such evidence.

As a collateral benefit, a credentialling system in radiology will establish training requirements and performance standards that non-radiologists who use radiological techniques (e.g. renal physicians, interventional cardiologists, gastro-enterologists and obstetricians) will have to meet.

Intuitively, therefore, credentialling has the potential to assure and improve the safety and quality of many aspects of radiological practice. The potential benefits of credentialling are widely acknowledged in the international literature on radiology and the need for credentialling was acknowledged by all those whom we consulted. We did not encounter any serious critique of the concept of credentialling. However, we did not find any empirical evidence of the effectiveness or efficiency of credentialling in maintaining or improving the things that it is expected to influence – the safety and quality of practice, patient outcomes, patient satisfaction, referrer satisfaction and, where applicable, employer satisfaction.

In this chapter, we examine some of the aspects of radiology practice that could be strengthened by a credentialling process.

4.2 Errors in radiology

4.2.1 Errors and discrepancies

In his submission on behalf of the RANZCR to the Victorian Ministerial Review of the Law of Negligence, Pitman wrote[43]:

> 'Diagnostic Radiology is a fundamentally different medical speciality from procedural medical specialities in that the performance of the Diagnostic Radiologist consists of complete **detection** of abnormalities present in a diagnostic examination, and their accurate **diagnosis**.'

It follows that errors occur when there is a failure to detect abnormalities and/or when there is a failure to diagnose abnormalities correctly. Thus, errors in radiology can be classified into three broad types:

- Acquisition errors, which occur when poor image quality prevents adequate reading.
- Perceptual errors, which occur when an abnormality is not detected ('false negative'), or when a lesion is reported in images that are in fact normal ('false positive').
- Interpretation errors, which occur when abnormalities are incorrectly diagnosed.

Errors in radiology differ from errors in most types of clinical physical examination in that the radiological image is a permanent objective record that can be reviewed, often in the light of the patient's subsequent clinical course and/or subsequent investigations (radiological and other). It is thus possible to check for radiological signs that have been 'missed'. By contrast, in most situations the only record of a clinical physical examination is the clinician's notes; the physical phenomena being examined may be evanescent or change with time, becoming more normal or more abnormal (e.g. blood pressure), less or more prominent (e.g. palpable lesions), or less or more detectable (e.g. heart murmurs).

The availability of a permanent record in some respects complicates the study of errors in radiology. Perceptual and interpretive errors are detected by comparing one radiologist's with another radiologist's reading of the same image. An error is considered to have occurred when one radiologist's reading differs from the other radiologist's reading. But which radiologist is correct? If the second reading is made some time after the first, the second radiologist may have the benefit of hindsight – a knowledge of the patient's intervening course, the results of further investigations, or the occurrence of clinical outcomes. If the second radiologist's reading is made immediately after the first, there will be no benefit of hindsight, and the second radiologist may then be more likely to make the same observations (and the same error) as the first radiologist. Thus, whether or not an 'error' has been made depends on factors other than the objective presence or absence of a radiological sign. The RCR has suggested that it is preferable to think of perceptual and interpretive 'discrepancies' rather than 'errors'[44]. This approach sets the scene for credentialling systems to take a constructive approach to 'discrepancies' rather than a critical approach to 'errors'.

Perhaps less logically, the term 'discrepancy' is also used to describe other types of potentially avoidable adverse events in diagnostic and interventional radiology. The RCR has identified six types of 'discrepancy'[45]:

- Perception and interpretation during reporting.
- The performance of an investigation.
- Complications during interventional procedures.
- The choice of investigation e.g. an unnecessary, or inappropriate, investigation particularly when this uses ionising radiation
- Over-reporting, where a report of presumed pathology, not confirmed by subsequent investigation, leads to further procedures. Where these procedures are associated with additional risk, this may be considered in the same way as missed diagnoses.
- Provision of inadequate, incomplete or incorrect clinical information.

Credentialling processes should investigate the occurrence of all of these types of 'discrepancy' in the practice of the candidate radiologist. As described in the next section (4.2.2), credentialling processes should identify patterns of errors or 'discrepancies', and suggest ways in which an individual's powers of observation and interpretation can be strengthened.

4.2.2 Distribution of errors and discrepancies

Rates of perceptual or interpretative errors or 'discrepancies' in radiology are surprisingly high. Various studies have reported error rates of 2-30 percent in radiology[46],[47]. Relatively few systematic studies of errors or 'discrepancies' in radiology have been published, although anecdotal information suggests that it is common for hospital radiology departments and corporate radiology practices to review and investigate adverse events on a regular basis. The degree of formality of such review processes is variable. Analysis is important for minimising errors because errors tend to recur, and a knowledge of 'error traps' helps to prevent repetition of the same mistakes[48]. Formal quantification and monitoring of errors and discrepancies requires rigorously-designed audit processes, but if this is not feasible, much can be learned from informal review (e.g. clinico-radiological meetings).

In a study published in 1992 and cited repeatedly since then, 182 cases that were presented at problem cases conferences during 1986-1990 were analysed[49].

- The 182 cases comprised 126 that were 'perceptual-cognitive' errors and 38 that were due to 'other mishaps' (complications and communication errors).
- The 126 'perceptual-cognitive' errors included 11 cases in which limitations of technique (including poor-quality images) led to lesions being missed.
- Of the remaining 115 cases 'perceptual-cognitive' errors, 53 were 'false-negative', 15 were 'false-positive' errors and 47 were 'misclassifications', i.e. interpretation errors.
- Some of the causes of the 53 'false-negative' cases were as follows: five were due to failure to consult previous images; four were due to inaccurate, incomplete or misleading clinical histories which misdirected the reading of the images; eight were due to the missed abnormality lying outside the area of the primary examination (e.g. a chest lesion was visible on an abdominal X-ray but overlooked); and 11 were due to radiologists who had detected one abnormality failing to detect a second abnormality in the same image.

- The 47 'misclassifications' comprised 18 in which the diagnosed lesion was less severe than the actual lesion (e.g. a mesenteric adenocarcinoma reported on an abdominal CT scan as scarring), 19 in which the diagnosed lesion was less severe than the actual lesion (e.g. gynaecomastia diagnosed as possible male breast malignancy), and 10 in which the lesion was misdiagnosed for another lesion of similar severity (e.g. a herniated nucleus pulposus of the C5-6 disk was reported as C3-4).

Whether 'discrepancies' are errors or are a product of the changing circumstances in which observations are made, their frequent occurrence suggests a high level of variation and a need to improve quality and consistency of radiological observation. By providing a rigorous framework for monitoring of performance, self-appraisal and professional development in areas of weakness, credentialling represents a mechanism for detecting and dealing with 'discrepancies' identified in the practice of individual radiologists. Two approaches are 'double reading' and 'open disclosure', described in section 4.2.3. This approach resonates with Pitman's recommendations[50] that '…errors of perception are acknowledged as an integral part of diagnostic radiology, and allowance is made for their inevitability' and that '…the culture of open disclosure in diagnostic radiology be encouraged and promulgated by the profession.'

4.2.3 Minimising errors and discrepancies

'Double reading'

There is evidence that 'double reading' of images, i.e. independent interpretation of images by two radiologists, can significantly reduce errors, but does not eliminate them. Diagnostic radiology practice in Australia involves single reading of diagnostic imaging examinations, and this accords with radiology practice internationally and historically. The MBS and private health insurance schemes have no provision for the reimbursement of 'double reading', so radiologists wishing to undertake 'double reading' do not receive reimbursement. As far as we could ascertain, the only situations in which 'double reading' is routinely practised in Australia is in the BreastScreen mammography program, and in departments where trainee radiologists have initial responsibility for reporting on images.

'Double reading' of images can be combined with clinico-radiological meetings in which errors are graded and their clinical significance assessed and discussed. In a recent study from a hospital radiology department, a review was carried out of 88 errors or discrepancies that occurred over a 12-month period and that were discussed at weekly clinico-radiological meetings. Errors or discrepancies were graded 0, 1, 2 or 3 respectively for no discrepancy, minor, significant or major discrepancy. The clinical significance of the errors was graded 0, 1, 2, or 3 respectively for no significance, minor significance (incidental to treatment or management), significant (affects treatment or management but not outcome) and major (affects outcome). Errors were classified as (a) errors or discrepancies of observation; (b) errors or discrepancies of interpretation; (c) failure to act on a report; (d) errors or discrepancies of technique, protocol and/or organisation; (e) errors or discrepancies of reporting; or (6) case has learning potential, but no error has occurred.

Among the 88 cases:

- 42 had observational errors or discrepancies
- 19 had interpretation errors or discrepancies
- there was one instance of failure to act on a report
- had errors of technique, protocol or organisation
- had reports with errors or omissions
- 7 discrepancies not identified by peer review
- The great majority of discrepancies were ascribed 1/1, 1/2, 2/1 or 2/2 respectively for grade and significance. That is, their clinical consequences were often minor, but were significant in some instances. Only one case was ascribed 3 for significance (a sigmoid polyp missed on a barium enema, presenting as a carcinoma five years after the examination).

'Double reading' is an obvious approach to the assessment of radiologists' skills with regard to perceptual and interpretation errors. 'Double reading' of samples of images could be a component of credentialling systems, but few radiology services would have the capacity or resources to undertake it on a regular basis. If 'double reading' is done, it should be undertaken using formal auditing methods with consistent recording of discrepancies. A selection of cases that have been 'double-read' should also be discussed in clinico-radiological meetings, which could be facilitated so that the lessons are crystallised and learned from the presentations and discussions.

The use of the term 'discrepancy' instead of 'error' helps to emphasise the perceptual judgement involved in the interpretation of images. 'Error' suggests fault while 'discrepancy' suggests variation. However, some authorities see the use of 'discrepancy' as merely euphemistic and unhelpful to the cause of improving radiological practice.

'Open disclosure'

The practice of 'open disclosure', whereby all images recorded in an examination and the radiologist's report are given to the patient, is almost universal in Australia. This differentiates radiology from other diagnostic specialties (such as endoscopy) where only selective evidence from an examination is collected or released to the patient[43].

The practical benefit of 'open disclosure' is that it allows the referring practitioner to view the entire examination as well as the radiologist's report. This provides an opportunity not only for the images to be 'double-read' (albeit often by a clinician who is not a radiologist), but also for the treating practitioner to correlate radiological findings with clinical and other findings. 'Open disclosure' is thus a route to the identification of perceptual or information errors that may have occurred in the original interpretation. It also has the potential to encourage dialogue and feedback between the radiologist and the referring practitioner although this rarely happens at present[51].

4.3 Is credentialling effective?

Intuitively, it seems likely that credentialling will be effective in improving the safety and quality of health care. It is hard to argue against the notion that care should be provided only by qualified professionals whose performance is maintained at an acceptable level. Credentialling could hardly be expected to be ineffective or have adverse effects. However, credentialling systems are expensive and complex, and this raises the question of their opportunity costs. Could other activities represent a better use of resources in improving the safety and quality, and ultimately the outcomes, of health care? Can the concept of credentialling be applied equally (with process differences) to a procedurally-oriented field like surgery, with clearly defined techniques and concrete outcomes, and a diagnostically-oriented field like radiology, with clearly defined techniques but a strong dependence on perception and interpretation and little opportunity to observe outcomes?

Little research-based evidence exists on the effectiveness of credentialling systems in improving the safety and quality of health care. We could find no empirical evidence on the effectiveness of credentialling in radiology. Empirical research on credentialling in surgery produced surprising results. A study of credentialling practices linked to surgical outcomes in 74 US hospitals demonstrated that more stringent hospital credentialling practices were unlikely to improve patient outcomes[52]. Reports describing credentialling systems and performance measurements in radiology express a view that credentialling leads to improvements in quality[38,39,39], but the results suggest only that credentialling is well received and leads to improvements in communications about re-appointment processes.

In conclusion, we can only say that credentialling *ought* to be effective in improving the safety and quality of health services and in helping to meet patient's needs. There is as yet *no empirical demonstration* that it works in radiology.

5 Approaches to the development of a credentialling system in radiology

5.1 Justification

Four major factors determine the need for a credentialling system in radiology in Australia.

The first, and most important, is that credentialling is widely accepted as essential to promote and sustain improvements in safety and quality of practice in all fields of medicine and surgery. The practice of diagnostic radiology has some unique features that distinguish it from interventional fields (e.g. surgery and interventional radiology) and from other diagnostic fields (e.g. pathology). Nevertheless, the system requirements for safety and quality apply to the practice of radiology just as they apply to any other field of medicine and surgery.

The second factor, related to the first, is that many aspects of the practice of radiology are not subjected to regular formal review. In particular, the validity and reliability of the interpretation of and reports on radiological examinations are not assessed on a regular or systematic basis. Yet error or discrepancy rates in interpretation of X-rays and other images are known to be substantial (ranging up to 30 percent). It is perhaps surprising that this extent of variation in interpretation of frequently-performed examinations continues with little systematic study. By contrast, other aspects of radiology practice are regularly and carefully reviewed. For example, standards and processes for acquiring radiological images are comprehensively defined and monitored, and personal auditing processes for interventional radiologists are also well developed.

The third factor, also related to the first, is the status, credibility and reputation of the radiology profession. Health professionals in other fields clearly recognise the quality of Australian radiological services in acquiring images and in carrying out image-guided interventions. However, the value of radiologists' interpretations of and reports on the images that they acquire is often questioned, particularly by specialists who have great knowledge of pathology in their fields of expertise. This questioning is reinforced by the error and discrepancy rates mentioned above and described in Chapter 4. As regards interventional radiology, many procedures that are increasingly undertaken by radiologists have been (and often still are) in the province of other proceduralists, e.g. angioplasty, solid-organ biopsies and the drainage of cysts and abscesses. There is pressure on the radiology profession to assert its leadership and uphold its expertise in these procedures.

Fourth – as mentioned in section 4.1 – credentialling can help to ensure that radiologists keep abreast of new knowledge in fields of medicine relevant to their imaging practice, thereby strengthening their capacity to provide expert advice on clinical problems and to undertake the most effective image-guided interventions.

These four lines of justification point to the need for a credentialling system in radiology. In the current ethos of accountability for safety and quality, credentialling is essential. This is

despite the fact that, at present, there is little empirical demonstration in any field of health practice anywhere in the world that credentialling is an effective or efficient mechanism for promoting and assuring safety and quality.

5.2 Constraints

Two factors impose difficulties for the implementation of an Australian credentialling system in radiology.

The first is the diverse nature of Australian radiology practice, which is divided between institutional practice in the public and private sectors and independent practice in the private sector. As described in section 1.3, almost 70 percent of respondents to a large survey of radiologists worked in the private sector, and 30 percent worked in the public sector. Almost half of the respondents worked in more than one sector (e.g. a radiologist could be engaged part-time in a public hospital and conduct independent private practice for the remainder of his or her working week).

The second is that credentialling systems inevitably impose a substantial workload and resource burden on those responsible for the system and those being credentialled. Systems in Australia and elsewhere have emphasised the need for credentialling to be comprehensive, empirically based, thoroughly documented, fair, and formative for those being credentialled. This inevitably means that credentialling is complex, requires thoughtful and expert development and implementation, and requires adequately-resourced committee and secretariat services. Attempts to dilute the credentialling processes, with a view to minimising the work and the cost, are likely to lead to superficial assessments of professional capacity that do not contribute to the safety and quality of radiology practice.

5.3 Governance

A major challenge created by the first constraint (the diverse nature of Australian radiology practice – see sections 1.3 and 5.2) is how to choose an organisational base for a credentialling system. Credentialling systems depend on stable and authoritative governance capable of imposing formal, structured processes on the profession, with due legal protection.

Two types of organisational base are possible. The first is a professional body, logically the RANZCR. The second is the clinical institutions that employ or engage radiologists, including independent group practices.

The advantage of an RANZCR-based credentialling system is that it would reach all radiologists in Australia, and be able to build on its well-established CPD system. By contrast, if credentialling was conducted by public- and/or private-sector clinical institutions that employ or engage radiologists, those who work in independent private practice may not have access to credentialling.

The disadvantage of an RANZCR-based credentialling system is that, while the RANZCR is an authoritative body that has the capacity to define and promulgate standards of practice, it does not have the authority to enforce processes and standards of practice on the organisations that employ or engage its constituents, or indeed on its constituents themselves. In addition, the RANZCR does not necessarily (and could not be expected to) have an appreciation of the aspects of local clinical service delivery that may be relevant to credentialling.

Credentialling could be conducted in corporate radiology practices that employ radiologists on a salaried basis. However, as these practices are run for profit, significant potential exists for conflict of interest between corporate financial objectives and the maintenance of radiologists' performance standards. Such conflicts of interest are less likely to exist in public-sector and not-for-profit health-care institutions.

Despite the disadvantages outlined above, it is difficult to identify any body other than the RANZCR that could possibly establish, govern and manage a comprehensive credentialling system for radiology in Australia. As suggested above, the RANZCR could build on its existing CPD system, and in the fullness of time the CPD system could be entirely absorbed into the credentialling process.

Two models of RANZCR involvement in credentialling can be conceived.

- In the first model, the RANZCR could develop and conduct the credentialling program and offer it to Fellows regardless of their employment arrangements.
- In the second model, the RANZCR could develop the credentialling program, conduct it for self-employed Fellows, and offer the program guidelines and materials to clinical institutions that employ or engage radiologists (all of whom could be expected to be Fellows of the RANZCR). The clinical institutions would then be responsible for the conduct of the credentialling program for employed or affiliated radiologists.

These two models could co-exist: the RANZCR could conduct the program for self-employed Fellows and any employed Fellows whose employers did not wish to conduct credentialling.

The decision to adopt one model or the other, or both, could be made by the RANZCR in consultation with its constituents (Fellows) and public- and private-sector employers of radiologists.

Decisions about governance models should take account of the fundamental intent of the agency that runs the credentialling system. A goal of the RANZCR is to promote the safety and quality of radiology practice. While safety and quality are important for public- and private-sector clinical organisations that employ radiologists and for self-employed radiologists who may seek to be credentialled, the need to manage risk is also a prominent concern. Employing organisations in particular may look to a credentialling system as a mechanism for risk management. If an employed radiologist who is credentialled by an authoritative credentialling body is alleged to be negligent, and the allegedly negligent act is in accordance with standard practice, the employer may believe that the fact of credentialling will mitigate liability. This assumption has not been tested in Australia. We have searched Australian case law and it appears that, despite beliefs of diagnostic radiologists' vulnerability to claims of negligence, particularly in relation to the perceptual and interpretive activities, negligence in diagnostic

radiology is difficult to prove. Negligence has, however, been legally proven in procedural radiology activities, such as interventional radiology.

5.4 Organisation

A major challenge created by the second constraint (the workload and resource burden on those responsible for the system and those being credentialled – see section 5.2) is how to set up and run comprehensive, fair and efficient processes for credentialling, and how to secure the necessary resources for a credentialling program on a stable long-term basis.

The implementation of a credentialling system is complex. We list 16 sequential steps that are required to set up a fully-developed system[53].

1 Allocate time and resources for the development of the credentialling system.
2 Identify and adopt standards of practice for radiology in Australia, taking account of different settings of radiology practice as necessary.
3 Set up a governance structure, with effective leadership and steering and advisory elements.
4 Develop operational policies for credentialling.
5 Provide infrastructure for the credentialling system, including secretariat and office facilities.
6 Develop processes for linking radiologists' credentials with local clinical need.
7 Develop processes for assuring the technical, clinical and professional capability of radiology service-delivery organisations in which credentialled radiologists will work.
8 Develop data collections and data-collection systems pertaining to the standards identified above and to the responsibilities of radiologists.
9 Specify policies and processes for the introduction of new imaging technology and techniques, and new interventional techniques.
10 Verify the qualifications of radiologists.
11 Verify radiologists' professional standing, experience, skills and knowledge.
12 Define individual radiologists' scope of practice.
13 Verify radiologists' participation in CPD.
14 Determine the frequency and processes of performance audit and review, and obtain radiologists' agreement to a performance review framework.
15 Carry out regular performance reviews.
16 Analyse performance data and inquire into and manage apparent deviations from standards of care.

Step 2 – the specification of standards of practice in radiology – warrants particular attention. Australian standards are available for some aspects of radiology practice, e.g. those relating to the safe operation of radiation-emitting equipment and the content and monitoring of a radiology CPD program. However, Australian standards have not been established for many aspects of individual radiology practice that should be covered in a credentialling system. Standards could be 'borrowed' from sources such as the US ACR and the UK RCR, together with

performance criteria and indicators where available. Standards could also be written for the RANZCR, based on evidence, overseas guidelines and Australian expert consensus. It would be important to ensure that any standards or guidelines adopted from overseas are adapted for the Australian environment and endorsed by the RANZCR.

As described in section 2.3, the scope of a radiologist's practice (or clinical privileges) depends on the radiologist's training and expertise and the capability of the clinical unit in which he or she works. It also reflects community need for particular diagnostic or interventional procedures, which in turn depends on such factors as the demographic and health profile of the population, the location, proximity to other services, and access to alternative providers. Considerable analysis may therefore be needed in specifying the scope of practice, and this overlaps with the analysis undertaken in the credentialling process. However the delineation of any clinician's scope of practice can raise sensitive issues relating to practice sustainability and income. It would be difficult for any RANZCR-run credentialling process to cover individual radiologists' scope of practice because many local factors have to be taken into account – factors over which the RANZCR does not have jurisdiction. If the RANZCR were to conduct credentialling, its role in relation to individuals' scope of practice is likely to comprise guidance and advice.

5.5 Approaches to performance measurement

Credentialling systems rely on the existence of indicators or measures of the performance of those being credentialled. Objective performance measurement is usually a major component of re-credentialling, and includes an assessment of processes and outcomes. Performance indicators have been defined for a few aspects of radiology practice in Australia, most notably interventional radiology. However, if a credentialling system were to be instituted on a widespread basis, there would be a need to develop and define an appropriate set of performance indicators, particularly for diagnostic radiology. The development of these indicators could draw on indicators suggested by the RCR. Table 5.1 gives some examples of the types of indicators that could be considered in relation to the components of the diagnostic radiology process. However, some of these indicators are reproduced from the UK RCR system and, as pointed out in section 3.4, some of the indicators that apply to radiology practice in the UK are not relevant in Australia.

Table 5.1: Components of the diagnostic radiology and examples of performance indicators

Component	Description	Examples of performance indicators for credentialling of radiologists
Review of patient and request	▪ Review of request from referring doctor ▪ Discuss with patient ▪ Select appropriate test/procedure ▪ Explain risks of the test/procedure and any associated risks to the patient ▪ Obtain patient's informed consent	According to a survey administered to all patients attending the service on two consecutive days, covering information on examinations/procedures: Percentage of patients who could answer 'yes' to all the survey questions.
Preparing the patient	▪ Preparing and positioning the patient for the test/procedure	
Performance of imaging test/procedure	▪ Perform the test/procedure ▪ Monitor the patient ▪ Obtain images ▪ Administer contrast media or sedation as necessary ▪ Assure image quality ▪ Document tests/procedures performed Done in accordance with agreed protocols, guidelines and regulations	- Proportion of patients receiving contrast media who develop an avoidable complication. - Proportion of patients receiving sedation who develop an avoidable complication.
Interpretation	▪ Review of the image and interpreting the results of the imaging test/procedure including review of previous scans, where available	- Active participation (presenting own cases) in clinico-radiological conferences. - Discrepancy rates in appropriate consecutive series of cases examined by each modality, subjected to 'double reading' by a second experienced radiologist. - Error rate in a standard set of images issued annually by the RANZCR.
Reporting	▪ Preparation and provision of written report to requesting doctor ▪ Other communication with requesting doctor as situation requires	- Timeliness of report. With regard to a sample of 25 consecutive requests and reports for each radiologist: - The number of cases where the referring doctor's question (explicit or implied) was answered. - The number of cases where an alternative investigation or next step was suggested, if indicated.

Based on: (1) Australian Healthcare Associates[54]; (2) de Lacey G, Godwin R, Manhire A[33]

5.6 Conclusion

The development of an Australian system for the credentialling of radiologists is widely supported and could help to enhance and ensure the safety and quality of Australian radiology services. However, credentialling is a complex process that demands substantial resources if it is to be effective, and there is little empirical evidence of its effectiveness in improving radiology practice. Given the arguments for credentialling and the impetus to establish clinical credentialling systems, we recommend that the RANZCR consider taking a leadership role in establishing a pilot program of credentialling for both diagnostic and interventional radiology. We also recommend that the RANZCR should undertake a careful evaluation of the pilot program and make the results widely available, preferably via a peer-reviewed publication. The pilot program and its evaluation would put the RANZCR at the forefront of credentialling internationally, not only for radiology but for credentialling in all clinical fields.

Appendix A: List of consultations

Name of individual and practice location	Role or type of practice
Ms Jane Grimm, Manager, QUDI	RANZCR staff
Professor Bruce Barraclough AO – Medical Director, Australian Cancer Network, Camperdown, Sydney	Former Chair, Australian Council for Quality and Safety in Health Care
Dr Luke Baker – Principal, RPAH Medical Centre, Newtown, Sydney	Independent private practice
Dr James Burnes – Director of Radiology, Southern Health Camberwell, Melbourne	Public hospital practice, and representative of Interventional Radiology Society of Australia
Dr Michael Carr – Medical Director, I-MED/MIA Network, Sydney	Corporate practice
Dr Nicholas Ferris – Director of Radiology, Western Hospital, Footscray, Melbourne	Public hospital practice
Dr Derek Glenn – Director of Radiology, South Eastern Sydney and Illawarra Medical Imaging, St George Hospital, Kogarah, Sydney	Public hospital practice
Dr Glen McNealy – Director of Ultrasound, Royal Hospital for Women, Randwick, Sydney	Public hospital and private in ultrasound, and representative of the Australian Society for Ultrasound in Medicine
Professor Alex Pitman – Director of Medical Imaging Department, St Vincent's Hospital, Fitzroy, Melbourne and formerly Director of Radiology, Peter MacCullum Cancer Centre, East Melbourne Ms Janine Horton – General Manager of Medical Imaging Department, St Vincent's Hospital, Fitzroy, Melbourne	Public hospital practice and representative of the CPD Committee of RANZCR Public hospital practice

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