A survey to investigate the current state of role development, and the perceived educational and training needs for MRI technologists in New Zealand performing role extension activities.

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Abstract

Purpose: This research was conducted to investigate role extension for MRI technologists in New Zealand. It sought to identify role extension activities performed by MRI technologists and to determine if any of these roles had or were becoming part of their routine practice. Information about the education and training given to the MRI technologists to enable them to perform these role extension activities and to identify the need for formal education was also collected.

Methods: Structured questionnaires were sent to MRI technologists in New Zealand to gather both quantitative and qualitative data. Closed questions were used for background information of the participants including the types of departments in which they work, the role extension activities they performed and the education and training they had received. Open questions were used to gather information about the participant's opinions about the education and training they had received.

Results: Eighty-eight questionnaires were returned from a total of 154 dispatched giving a 57% response rate. Respondents worked in public and private departments ranging in size from one scanner with one or two technologists to four scanners with over 15 technologists. Almost all of the respondents performed IV cannulation, contrast injection, routine scans and complex scans. Other role extension activities performed by some respondents included drug administration, protocolling forms, prescribing contrast and other drugs, and checking pre-MRI orbit x-rays. Reporting routine MRI scans was not performed by any MRI technologist. Education and training received for the role extension activities included: learning by experience; informal and formal in-house training; formal education; and postgraduate qualification from an education provider. More formal training was provided for procedural role extension activities, such as IV cannulation, than for those requiring cognitive skills, such as prescribing contrast and checking pre-MRI orbit x-rays.

Conclusions: The data showed MRI technologists were performing a variety of role extension activities to varying degrees. The education and training received by some was perceived to be inadequate, being either as courses provided for other health professionals, or experiential learning. A few MRI technologists were unofficially prescribing contrast and other drugs, and checking pre-MRI orbit x-rays without having proper support and education.

Acknowledgements

Deciding on a topic for a dissertation can sometimes be the most difficult part of the process. The idea for this topic came from a combination of experiences including: working in medical imaging for nearly 30 years in both public hospital and private departments; spending time as a lecturer teaching the next generation of MRTs; and having first-hand experience of the changes to the role of the MRT. Some of the skills and knowledge I have acquired are as the result of hard work and perseverance. Sometimes I experienced frustration at not understanding why I was doing certain things or what they meant and realised the training, for some role extension activities I perform, was inadequate or just learned by experience. I thought there must be others out there who felt the same, so out of that grew the idea for this dissertation.

I wish to acknowledge the support I have received from the NZIMRT, and I would especially like to acknowledge and thank the Rouse Education Trust for believing this was a worthwhile project to sponsor. I would also like to thank my supervisors Adrienne Young and Dr Jill Yielder who have provided valuable advice and guided me during this research which at times has been a lengthy process with bursts of frantic activity; however I got there in the end! Thank-you also to my work colleagues, who understood why sometimes I was pre-occupied, and my friends who gave me moral support and kept asking “haven’t you finished that yet?”

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Abbreviation	*Expansion*
ACC	Accident Compensation Corporation
AIR	Australian Institute of Radiographers
APN	Advanced Practice Nurse
APR	Advanced Practice Radiographer
ASRT	American Society of Radiologic Technologists
CBA	Competency Based Assessment
CT	Computerised Tomography
DHBNZ	District Health Boards of New Zealand
DNA	Did Not Answer
HDC	Health and Disability Commissioner
HPCA	Health Practitioners Competence Assurance
IV	Intravenous Cannulation
MOH	Ministry of Health
MRI	Magnetic Resonance Imaging
MRT	Medical Radiation Technologist
MRTB	Medical Radiation Technologists Board
MSK	Musculo-skeletal
NHS	National Health Service
NP	Nurse Practitioner
NSF	Nephrogenic Systemic Fibrosis
NZ	New Zealand
NZIMRT	New Zealand Institute of Medical Radiation Technologists
RA	Radiologist Assistant
RANZCR	Royal Australian and New Zealand College of Radiologists
REA	Registration Examination Assessment
SOP	Scope of Practice
UK	United Kingdom
USA	United States of America

Chapter 1: Introduction

Working Title

A survey to investigate the current state of role development, and the perceived educational and training needs for MRItechnologists in New Zealand performing role extension activities.

Introduction

The traditional role of the radiographer or Medical Radiation Technologist (MRT) has changed since the late 1990s as the need and demand for medical imaging services have increased. An increased utilization of medical imaging has occurred as a result of technological advances and an increased demand of radiological services from healthcare providers (Price, Miller, & Mellor, 2002). The increased demand for radiological services has in turn resulted in greater demands on radiologists both in the range of modalities available and the number of examinations expected (Priceet al., 2002). Radiographers in the United Kingdom (UK) have embraced this change allowing the radiographer's role to develop accordingly with the adoption of role extension activities occurring over a period of time (Price & Le Masurier, 2007). In 2004 the Council for the Society of Radiographers approved a supporting framework that comprised of a four tier system to include unregistered assistant practitioners, registered practitioners, advanced practitioners and consultant practitioners (Yielder, 2007a). The implementation of the four tiered system has been followed closely by researchers to investigate the impact of this development on stakeholders, whether it be positive or negative (Price et al., 2002; Price & Le Masurier, 2007).

When comparing the UK system to those currently operating in New Zealand (NZ) and Australia, there appears to have been, on the surface at least, very little role development as both countries still have only one level of registered practitioner. However the New Zealand Institute of Medical Radiation Technologists (NZIMRT) and the Australian Institute of Radiographers (AIR) have responded to the changes occurring internationally. In Australia it has been reported by Smith, Yielder, Ajibulu and Caruna (2008) that the AIR and the Royal Australian and New Zealand College of Radiologists (RANZCR) have had discussions and agreed to conditionally formalise existing extended roles. In NZ the NZIMRT has also had discussions with the District Health Boards of New Zealand (DHBNZ) regarding a tiered career pathway. As a result of those discussions a working party was formed and a large scale research study was performed on the behalf of the NZIMRT to investigate the need to extend existing roles (Yielder, 2007b). The NZIMRT published the research findings along with conclusions and recommendations. The report recommended introducing a three tiered system to NZ consisting of an assistant practitioner, a practitioner and an advanced

practitioner with the opportunity for a fourth level. The fourth level, that of consultant practitioner, has been left as an area of future development after the successful implementation and consolidation of the advanced practioner role (NZIMRT, 2008). The initial aim was to focus on the role of the advanced practitioner and to gain acceptance for this position as this level of development has the strongest support as reported from Medical Radiation Technologists (MRTs) and clinical managers surveys (NZIMRT, 2008). In order to gain this acceptance the report recommended there be a co-ordinated approach to ensure the formation of a career pathway with recognised levels of attainment and approval of these levels by the governing Medical Radiation Technologist Board (MRTB) along with the development for each level of national criteria for standards of practice. Other areas covered by the recommendations include the development of role extension activity protocols, ongoing monitoring and audits, developing appropriate training and education programmes, staff development, maintaining and monitoring stakeholder satisfaction, job descriptions, and on going research (NZIMRT, 2008).

Role Development Terms

Role development describes the changing role of the MRT and encompasses role expansion and role extension (Yielder, 2007b). Advanced roles also emerge from role extension, however extended practice and advanced practice are not the same. Clarification of these terms is necessary to be able to understand different stages of role development. Role expansion occurs as a current role changes and develops over time. For example the addition of quality assurance monitoring in an area of current practice (Bolderston cited in Yielder, 2007b). Role extension occurs where the practitioner takes over roles, such as intravenous (IV) cannulation, which were previously performed by medical practitioners (Price et al, 2002) or another profession (Bolderston, Smoke, Harnett, Lewis & Wenz, cited in Yielder 2007b). Advanced practice on the other hand, according to Snaith and Hardy (2007), comes with greater autonomy, responsibilty and accountability for wider areas of service management along with a high level of skill and knowledge within a specific speciality. This requires the advanced practitioner to be not only an expert in a specific area but also to be involved in leadership, research and to possess a range of personal and professional qualities, practical and intellectual skills along with a well developed ability to interact and communicate with others (Snaith & Hardy, 2007). Price and Edwards (2008) suggest that advanced practiced is not limited only to practitioners who have expertise in a specific area, but also applies to a practitioner who has developed expertiseand knowledge over a wider area that crosses traditional and non traditional boundaries.

Role extension can be part of an advanced role however performing role extension tasks does not necessarily make for advanced practice and according to Snaith and Hardy (2007) it is not obligatory for clinical departments to develop advanced practice roles for MRTs.

Role development in MRI

Over the past decade Magnetic Resonance Imaging (MRI) as an imaging modality has developed and become more accessible as acceptance and demand for the service grows. Musculoskeletal, neurological and abdominal imaging for many medical conditions is now performed routinely in MRI departments established in provincial NZ, rather than only in the main population centres such as Auckland and Wellington. As the number of MRI scanners operating throughout NZ increases, there are more MRTs completing postgraduate education to gain a scope of practice in MRI. When the first MRI scanners were installed in NZ, radiologists were often very involved in the scanning process and they would often plan each scan (Young, 2008). Today however, many routine scans are performed without radiologist direct supervision.In addition MRI technologists are performing venipuncture, contrast injections and administering other drugs relevant to the procedure(Sinclair & Yielder, 2007). The role of the MRI technologist is in a state of development and change. Similar development occurred with the introduction of ultrasound in the 1980's. When the first ultrasound machines were installed the radiographer (as MRTs were known at that time) organised the patient and room for the radiologist to perform each scan. Later the sonographers (radiographers with a postqualification diploma in ultrasound) would scan and the radiologist would check each scan. Today some sonographers are scanning and reporting their own scans with their name included on the final report. Sonographers are required by the MRTB to have an approved postgraduate qualification in ultrasound. MRItechnologists are also required to have an approved postgraduate qualification therefore will we eventually see MRI technologists playing a greater role in the decision making process of MRI scanning and reporting MRI images as is happening in ultrasound? There are indications that role extension is already happening. While information about role extension activities specifically for MRI is scarce, in the UK MRI radiographers are authorising MRI requests, performing IV cannulation and injecting gadolinium (Price et al., 2002) and reporting MRI images (Price et al., 2002; Young, Yielder & Murphy, 2010).

Radiographers or MRTs?

While the term MRT is used in New Zealand, other countries use different names including radiographer in the UK and Australia, and radiologic technologist in the United States of America (USA). New Zealand MRTs were also known as radiographers in the past. Sonographers are MRTs or radiographers who have gained a post graduate qualification

and work in the modality of ultrasound. MRTs with a MRI scope of practice can be referred to as MRI technologists or MRI MRTs. Any of these terms can be used in the same context and the different terms were used in this report depending upon the era, modality and country from which references are made.

Research purpose

The purpose of this research was to assess the current status of role extension for MRI technologists in NZ. The information gathered from this research could enable the identification of areas of natural progression for role extension and also any areas MRI technologists would like to develop further.The assessment wasachieved by surveying MRI technologists with a training scope or a full scope of practice in MRI. The MRI technologistswere asked to answer a questionnaire which aimed to gather information on their current roles and the level of support and training they had or wish to have for role extension activities. Young (2008) conducted similar research; however this research project differed as NZ MRI technologists were surveyed with the intention to investigate which role extension activities were being performed and by whom at that time. The type of training received to enable the technologists to perform those tasks was also investigated along with whether or not the technologists felt their training was adequate. Young's research included a questionnaire for NZ MRI technologists, semi-structured interviews and an online questionnaire for UK radiographers. The aim of Young's research was to investigate attitudes of MRI technologists about possible career opportunities and to identify areas of role extension to develop proposals for formal recognition and the improvement of the MRI technologist role. Young's NZ questionnaire examined motivation, job satisfaction and career perceptions and included questions about role extension activities which were also included in this questionnaire. Young's research asked general questions about training and supervision which does not differentiate between the different role extension activities. This research investigated further by asking MRI technologists for their opinions about specific role extension activities, supervision and their educational needs. The focus of this research was to investigate what is actually happening at that time, which can be compared to Young's research. However in contrast to Young's research, which investigated attitudes about job satisfaction and perceptions, this research investigated training and educational requirements for different activities.

This dissertation therefore aimedto investigate current role extension opportunities in MRI to identify specific tasks and educational support provided for any role extension activities MRI technologists are currently performing. This knowledge may provide further support and direction for the educational needs of MRI technologists who wish to extend their role.

Aim and Structure of the Research

The aim of this research was to investigate the current status of role extension for MRI technologists. The objectives are to:

1. Identify role extension activities currently performed by MRI technologists.
2. Differentiate between activities seen to be routine and those that are identified as role extension.
3. Determine how widespread the role extension activities are that are currently being performed by MRI technologists in New Zealand.
4. Determine the education and training (formal and informal) given to the MRI technologists to enable them to perform these role extension activities.
5. Identify areas where formal education requirements may be needed.

In order to meet these objectives a questionnaire was sent to all MRTs working in New Zealand who have either a training or full scope of practice in MRI.

Chapter two will provide a review of the literature looking at the reasons for formal role extension for MRI technologists, comparing role extension development for nurses and MRTs in various parts of the world, the type of activities being performed, educational requirements and support. Advanced practice is also investigated along with the need for standards and the legal implications. Chapter three discusses the research process used for this dissertation and discusses why a survey approach was chosen for this project. Methodology, data collection and analysis are also explained, along with discussion on relevant ethical issues. The response rate to the questionnaire and its relevance to the reliability and validity of this study is also discussed here. The results are displayed in Chapter four, with a discussion of those results and emerging themes in Chapter five and final conclusions in Chapter six.

Chapter 2: Literature Review

Introduction

The development and acceptance of advanced medical imaging technologies such as MRI, has provided the opportunity for change and expansion of the role of the MRT. The introduction of the Health Practitioners Competency Assurance (HPCA) Act (2003) also impacted on their role as the main purpose of the HPCA Act (2003) was, and still is, to protect public health and safety and to ensure practitioners are fit and able to perform competently throughout their professional life. Regulatory authorities were established and given the power to prescribe qualifications and define scopes of practice for practitioners (Ministry of Health (MOH), 2008). The regulatory authority for MRTs, the MRTB, requires that registered MRTs have a defined scope of practice, with some scopes of practice, such as MRI, requiring an accredited postgraduate qualification. More MRI scanners than ever before are operating in NZ with an associated greater demand on the radiologists' time for reporting more complex and greater numbers of MRI scans. As a result radiologists now spend much less time in the control room compared to the early days of MRI when the radiologist often would plan each scan. Today it is common for the MRI technologist to perform the majority of the planning especially for routine scans (Young, 2008). Other tasks, such as venipuncture and contrast administration, which were the responsibility of the radiologist, are now being handed over to the MRI technologist. The role of the MRT has changed and developed over time but is still in the early stages when compared to the advanced and consultant radiographers roles in the UK. Themes to emerge from the literature for this review include: role extension for health practitioners; the changing roles of the MRT; role extension activities; role extension and advanced practice; educational and training requirements.

Role extension for health practitioners

While this research dissertation is focused on role extension and educational needs for MRI technologists in NZ, it is only one small part of the whole picture for role extension opportunities for MRTs and other health practitioners such as nurses, around the world. Early role extension opportunities arose for nurses in the United States of America (USA) in the mid-1960s (Marsden et al., as cited in Furlong & Smith, 2005) as a response to an increasing need for medical specialization along with poor access for patients to medical care and a lack of medical practitioners. This need resulted in the role of the nurse practitioner (Paterson & Peels, as cited in Furlong & Smith, 2005). Further role extension for nurses occurred in the UK in the 1980s (Wilson & Bunnell, 2007), then in NZ in the 1990s, the Minister of Health showed support for policy and legislative initiatives to occur in order for

nurses to provide more effective and less fragmented primary health care for chronic disease (Jacobs & Boddy, 2008). There was no clear title or definition of the roles for these nurses, who were called 'nurse practitioners' (NP) or 'advanced practice nurses' (APN), resulting in confusion. The roles of advanced practice nurses varied in practice because of this lack of definitive meaning and standards of advanced practice (Furlong & Smith, 2005). According to Pulcini, Jelic, Gul, and Yuen Loke (2010) the range of activities NPs or APNs can perform varies greatly, including health assessment and diagnosis to disease management, health education and promotion, the ability to refer to other health practitioners, medication and treatment plans. Two other areas of role expansion for nurses, which are of interest to MRTs, are prescribing drugs, which occurred in a variety of settings and countries (Chaston & Seccombe, 2009; Wilson & Bunnell, 2007), and the requesting of radiographic examinations. Requesting radiographic examinations by nurses in emergency departments in the UK quickly became a routine part of their work, followed by the interpretation of those images although this was not so readily adopted as there was opposition from radiologists (Hardy & Barrett, 2003). The range of examinations the nurses could request varied between departments according to local needs, although they were generally restricted to the appendicular skeleton with pelvis and hip included if there was an agreed treatment pathway for the patient. There were also limitations on the radiological images the nurse could interpret including the age of the patient and the body area (Hardy & Barrett, 2003).

The changing role of MRTs

As nurses have challenged and moved boundaries with the expansion and development of their roles, so too have MRTs. Following trends and developments that have occurred overseas, changes in medical imaging includes UK radiographers reporting images for emergency departments, performing barium studies, performing IV cannulation and contrast injection in National Health Service (NHS) departments (Price et al., 2002; Price & Le Masurier, 2007). Radiographer reporting was first recorded in ultrasound in the early 1970s and was followed by reporting mammograms in 1989 and subsequently the reporting of barium enemas and the appendicular skeleton in the early 1990's (Price et al., 2002). Following results from surveys in 1998 and 2000, Price et al. (2002) also revealed that UK radiographers were performing other role extension activities such as: IV injection (including gadolinium in MRI); performing barium enemas; and using red dot systems to highlight abnormalities on images taken in the emergency department. A follow-up study by Price and Le Masurier (2007) showed that by 2004 UK radiographers had expanded further the areas in which they were reporting to include barium meals, chest x-rays, nuclear medicine, paediatric imaging and axial plain films. The NHS trusts planned to implement a 4 tier

system to extend the existing practitioner level to provided a structured system which encouraged new ideas and ways of working, which was seen by Price and Le Masurier (2007) as being essential in order to not only maintain an effective service but also to fully utilise a skill mix. Friedenberg (2000) states “skill mix, as applied to medicine, implies the utilization of expertise from individuals in related fields to complement or increase the expertise available to patients …” (p.630) or more simply “allowing technologists, with proper training, to perform work otherwise performed by the medical practitioner thus freeing up their time and skills for other tasks” (p.630). A four tiered model was introduced adding assistant, advanced and consultant practitioner levels to the previous single registered practitioner level to provide structure and also to act as an incentive for the implementation of new ways to allow skill mix to develop (Price & Le Masurier, 2007). Research by Price and Le Masurier (2007) showed that of the three newly introduced levels, more practitioners were working at an advanced level than the other two newly introduced levels (excluding the pre-existing registered practitioner level) with the least number of consultant radiographer posts being established. These changes to the career structure for UK radiographers prompted the NZIMRT to commission a report investigating role development for MRTs in NZ. The report suggested there was a need for advanced practice in NZ and recommended the introduction of two further practitioner levels, that of assistant and advanced practitioner to the current single level with the option of adding a further consultant level once the advanced practitioner level has been established (NZIMRT, 2008).

While role expansion is still in its early stages for MRTs in NZ, progress has also occurred at various rates around the world with the rate and type of role expansion occurring according to the local needs of the community. Smith, Yielder, Ajibulu, and Caruna (2008) reported from Australia there had been little progress in developing or formally recognising the radiographers role by 2005. While there was little formal recognition Smith et al (2008) also reported that some radiographers were already performing a variety of role extension activities for which they have received ‘on the job’ training. These activities included: barium studies; the insertion of central venous lines and naso-gastric tubes; IV cannulation and contrast injection. While medical practitioners hold a range of diverging opinions regarding role extension for radiographers, they do agree that existing expanded roles need to be formally recognised, legitimised and be supported by continuing education (Smith et al., 2008). In the Western Pacific the remoteness and lack of radiologists and other specialists has resulted in radiographers being asked to interpret images. Again there is no formal recognition or training for this (Smith et al., 2008). Further afield in the USA in the early 2000’s the American Society of Radiologic Technologists (ASRT) strived to gain support from radiologists for radiographer role development which resulted in the introduction of the

radiologist assistant (RA) (May, Martino, & McElveny, 2008). While the actual RA role varies from site to site there are some general restrictions on which tasks the RA can and cannot do. For example the RA can: evaluate a patient's condition at any time throughout the procedure; perform, monitor and adapt selected examinations only under radiologist supervision. They cannot replace the radiologist, work independently, prescribe medicines or treatments, or provide any official image interpretation (May et al., 2008). Cowling (2008) sums up these variations in radiographer role development in different areas around the world with four levels of development: the first level includes the UK and USA where formal advanced roles with supporting educational needs have been implemented; the second includes NZ, Australia, Canada, Japan and South Africa, where there are forces driving change however these changes have not yet occurred; the third level included countries, such as Jamaica, Brazil, Kenya and Hong Kong, where the radiography profession is recognised and there is a move towards a degree or equivalent entry qualification; and the fourth level includes countries, such as India; some central American countries and some African nations, where there is no formal recognition of the profession and no national education standards.

Role Development in New Zealand

The development of advanced practice can be separated into four levels according to Cowling (2008). The first level exists where the collaboration of government and medical agencies along with professional bodies and education providers, with supporting research are driving for change there has been action and changes put in place. The second level occurs where there is collaboration and a driving force as in level one; however implementation of changes has not yet taken place. Level three is the recognition of the profession with steps in place to move the minimum requirement for a registered practitioner to a degree or an equivalent. With the fourth level the profession has no formal recognition and national educational standards have not been established. According to Cowling (2008), NZ MRTs are currently sitting on the edge of change (level two) within their profession where there are forces driving for change but those changes have not yet been implemented. The support for change by radiologists and MRTs is evident in research performed in NZ over the last decade. Yielder (2007a) suggested the chronic staff issues in NZ needed to be addressed and any solution should be considered. Research by Wilson (cited in Yielder, 2007a),Tubb (cited in Yielder, 2007a), and Hay (cited in Yielder, 2007a), suggested there was a need for a professional career structure which allows and rewards role development which would in turn result in increased job satisfaction for MRTs and improve staffing issues such as recruitment and retention. Hay (cited in Yielder, 2007a), expanded this further by stating that a lack of career structure and a defined pathway was a disincentive for NZ MRTs

working overseas to return to work in the profession in NZ. Anecdotally UK radiographers who came to NZ to work were also unwilling to stay because of the limited range of roles (Yielder, 2007a). This attitude was also reflected by NZ MRTs as shown by the results of a survey by Yielder and Sinclair (2006) in 2005, when NZ MRTs felt their clinical experience was not recognised and their skills and knowledge were under-utilized, with very few opportunities available with which to demonstrate this. While there were more opportunities for advancement in a managerial direction, many MRTs were not inclined to go down this path preferring to follow a clinical pathway and therefore supported the formalisation of an advanced practice role (Yielder & Sinclair, 2006).

A survey of NZ radiologists revealed there was also some support for MRT role extension opportunities, especially from those who had previous overseas experience with role extension by MRTs. The delegation of simpler tasks, especially in the area of patient care had the most support from radiologists and some also indicated MRTs were already performing venipuncture and contrast injection in Computerised Tomography (CT) and MRI. The area with the least level of radiologist support was for MRTs reporting images (Yielder, Sinclair, Gunn, Thompson, & Nash, 2008). This lack of radiologist support was at odds with the MRTs who, along with wanting to perform those simpler tasks also indicated they would like to report images either in the emergency department or supplying provisional reports (Yielder & Sinclair, 2006). NZ MRI technologists also indicated a desire to report MR images although also suggesting that there would be a lack of support from radiologists (Young, Yielder, & Murphy, 2008). While they agreed that role extension would increase job satisfaction for MRTs, increase interest and the quality of MRT work, radiologists were also concerned about the quality of MRT work, along with the accuracy and the cost, financially and time-wise, of compliance (Yielder et al., 2008). However some MRI technologists felt that one of the advantages of technologist reporting would be an improvement in the quality of scans because of the increased knowledge in the appearances of pathology (Young et al., 2008).

Role extension activities

Friedenberg (2000) suggests role extension activities can be categorised into two main groups, procedural and cognitive, depending upon the type of activity. Procedural role extension is where tasks can be taught, standardised, assessed and transferred to other staff with appropriate training. Cognitive roles involve decision making, perhaps making a differential diagnosis and suggesting further investigative procedures. Radiographers in the UK are performing both types of activities as Price et al., (2002) reported in findings from UK surveys in 1998 and 2000. Procedural role extension activities UK radiographers were

performing included IV injection and barium enemas along with some cognitive role extension activities such as reporting ultrasound, skeletal radiography, barium enemas images and to a lesser extent mammography, nuclear medicine, paediatric and chest imaging. An increase in all areas was reported by Price and Le Masurier (2007) ina follow-up survey of UK radiographers in 2004, with an expectation that over the following year radiographer reporting would expand to include CT and MRI heads and MRI knees. A more recent report by Smith and Reeves (2009) confirms a further increase in role extension by UK radiographers to 2009. In contrast to the roles performed by UK radiographers, in the USA the advanced practice radiographer (APR) or RA can only perform procedural tasks to support the radiologist and *cannot* act independently, replace the radiologist, prescribe, officially interpret images or supply reports (May, Martino, & McElveny, 2008).

Research from other countries, including New Zealand, has also reported the adoption of MRT performed venipuncture and contrast injection (Friedenberg, 2000; Keenan, Muir, & Cuthbertson, 2001; Price et al., 2002; Sinclair & Yielder, 2007; Yielder, 2007b; Yielder et al., 2008; Young, 2008). Performing research scans was also listed as a role extension activity by Yielder et al., (2008). While these activities are specifically related to medical imaging and technical aspects of the MRT role there are other areas relating to patient care that also need to be considered. Smith and Lewis (2002) suggest patient information and advocacy as being areas for further development. As medical imaging becomes highly technical, radiologists have less patient contact. The patient can feel threatened either by the technology or the diagnosis so the MRT, according to Smith and Lewis (2002), is in an ideal postion to give the patient correct information and to act as an intermediary between the patient and the radiologist. Other roles pertinent to MRI and identified as role extension activities in the literature include: the administration of other drugs relevant to the procedure (Sinclair & Yielder, 2007; Yielder et al., 2008; Young, 2008) and prescribing those drugs (Smith & Lewis, 2002; Yielder, 2007b; Yielder et al., 2008); protocolling forms; performing routine scans unsupervised and post processing of images (Young, 2008) and image interpretation. Prescribing rights and image interpretation are to be discussed further as they are the responsibility of medical practitioners, however prescribing rights were given to nurses early in their role development (Chaston & Seccombe, 2009; Wilson & Bunnell, 2007) and is a role extension activitiy which could be transferred to MRTs. The interpretation of images, including reporting routine scans, was identified by Young et al.,(2008) as an area of potential role extension for MRI technologists.

Prescribing rights

NZ registered midwives were granted prescribing rights in the Nurses Amendment Act 1990 and while they can prescribe from an unlimited list, they may only prescribe within their own scope of practice (Jacobs & Boddy, 2008). District nurses in the UK have been able to prescribe from a limited list of drugs since 1994 and all other UK nurses have had prescribing rights since 2002. Nurses can train to be either: independent prescribers, who can prescribe drugs, originally from a list of 240 drugs, for specific conditions; or as supplementary prescribers, meaning they can prescribe any drugs as long as a doctor has approved their actions (Chaston & Seccombe, 2009; Wilson & Bunnell, 2007). However in NZ there is little support from radiologists for MRI technologists gaining prescribing rights for the few drugs which would be relevant to the MRI procedure such as contrast, buscopan and sedation (Yielder et al., 2008). Allowing MRI technologists to prescribe these drugs under certain conditions may allow for more efficient delivery of service, and allows the technologist more autonomy. Therapy radiographers in the UK received prescribing rights after legislation was passed as patient care was compromised because radiographers were unable to prescribe drugs for the management of the side effects of treatment (Francis & Hogg, 2006).

Image interpretation

Possible role extension activities for MRI technologists involving some form of image interpretation ranged from reviewing the images and reporting the findings to the radiologist, to provisional or double reporting of MRI images (Yielder et al., 2008) and reviewing orbit x-rays for metallic intraocular foreign bodies (Yielder, 2007b). Some nurses in the UK are interpreting emergency department images (Hardy & Barrett, 2003) while radiographers are reporting a wide variety of examinations ranging from x-ray images of the appendicular and axial skeleton, barium studies (meals and enemas) and other fluoroscopic procedures, chest x-rays, mammography, nuclear medicine, ultrasound CT head scans and MRI (Price & Le Masurier, 2007). However in Australia, where radiographers do not formally report images, Smith and Baird (2007) report that with a foreseeable shortage of radiologists in the future, the training of senior experienced radiographers to perform a limited role in the interpretation of images is a feasible option. These trained radiographers would then meet the demand for immediate reporting, however they would be limited to provide a descriptive report only where abnormalities are noted. Any medical interpretaion of the clinical significance of these abnormalities would remain in the domain of the radiologist.

Education and training

Education and training requirements for role extension vary greatly with different health practitioner groups and types of activities. Nurses in the UK with a Bachelor's degree are able to prescribe however NZ nurses have to complete a clinical Masters degree to specialise in a specific area before they are able to receive prescribing rights (Chaston & Seccombe, 2009). Formal image interpretation of a limited range of emergency department films is being performed by nurses in some departments in the UK depending upon locally agreed conditions. The education and training these nurses received was not consistent across the departments as while they received local in-house training they may or may not have completed an accredited short course or formal education (Hardy & Barrett, 2003). This variation of standards occurred as local medical practitioners decided the extent of training and education the nurses needed, according to local needs rather than agreed upon standards which were based on best practice. Also the content of the course was not necessarily about image interpretation specifically, but supported their role development (Hardy & Barrett, 2003). The importance of specific courses relevant to image interpretation catering to specific groups is supported by research by Piper and Paterson (2009) which showed when comparing accuracy of image interpretation, radiographers with no training performed as well as nurses with training.

Furthering education is an integral part of role advancement for all health practitioners and as the range of activites MRTs are performing grows there must be appropriate training and educational support (White & McKay, 2002). NZ MRTs are ready to embrace opportunities to extend roles and are willing to complete further academic and clinical requirements as necessary (Yielder & Sinclair, 2006). As traditional boundaries become less defined with MRTs adopting a greater variety of role extension activities, and the development of the advanced practitioner role, it is important that medical imaging education also responds and adapts to the changing needs and demands for post qualification education (Price et al, 2002).

In a survey of NZ MRI technologists by Sinclair and Yielder (2007) technologists indicated that while they had all received training and education for performing IV cannulation and contrast injection, the type of training and education varied from being in-house to a university course. So while training in some form is readily available there is a wide variety of standards. Training and education for IV cannulation is easily accessable and accepted, however for other role extension tasks such as reporting, some MRTs have expressed concerns about their lack of background knowledge compared to radiologists (Young et al., 2008). Young et al. (2008) suggest that MRTs as a group are intelligent enough to be able to

perform the advanced cognitive tasks required for image reporting in specific areas if given the right educational support and training. The first step towards MRT image reporting is the ability to recognise abnormalities which for the MRT comes from both experience and education. MRTs were already a step ahead of nurses in image interpretation as research by Hardy and Barrett (2003) showed untrained MRTs were as good as detecting abnormalities when compared to nurses who had received training. Research by McConnell, Thompson, and Kumar (2008) showed that even a short course in pattern recognition and abnormality detection for NZ MRTs for conventional imaging resulted in greater confidence and accuracy for the MRTs. They recommended some pattern recognition courses be included as a pre-requisite to postgraduate education. However, educational developments such as this should be done by collaborating with the relevant clinical groups, in this instance the radiologists (Hardy & Snaith, 2006), as reporting by MRTs is not likely to develop without the support from radiologists.

While pattern recognition is one area of development, it has been suggested that other areas such as people skills and leadership should be included in the changing educational environment (Kelly, Piper & Nightengale, 2008; Price & Edwards, 2008) along with allowing for independent research by practitioners to investigate innovative role development opportunities (Hardy & Snaith, 2006). As changes occur at the higher end of practice, it is suggested by Kelly et al. (2008) that changes also need to be made at undergraduate level to provide support for role extension and advanced practice.

Role extension to advanced practice

While role extension is task focussed and a natural process of acquiring skills and/or responsibilities after initially gaining registered status, advanced practice requires a combination of professional skill, development and personal qualities of an individual (Hardy, Legg, Smith, Ween, Williams, & Motto, 2008; Hardy & Snaith, 2006; Snaith & Hardy, 2007; Nightingale & Hogg, 2003). However there is no one pathway for achieving advanced practitioner status with Snaith and Hardy (2007) suggesting recognition as an advanced practitioner for many MRTs would be the result of a combination of the MRT's experience and their professional development, which includes informal and formal education. The acquisition of extra skills and responsibilites must be accompanied by an increase in knowledge and ability in an area which could be shown by furthering education to a higher level such as a Masters' degree, although this may not necessarily be indicative of advanced practice (Hardy & Snaith, 2006). Practitioner led research and development which contributes to innovative practice is another area seen as being fundamental to the advancement of the role of MRTs (Hardy & Snaith, 2007).

However a lack of clearly defined standards for advanced practice has been identified by Snaith and Hardy (2007) as a barrier to its development, but there are key points identified in the literature that indicate advanced practice. Hardy and Snaith (2006) propose that postgraduate qualifications alone do not indicate advanced practice as many postqualification courses are in place to provide education for the acquisition of skills for role extension activities rather than for investigating new areas of development and the application of acquired skills to improve service quality. Often advanced practitioners are specialists in a specific area and have the ability to develop a wide range of skills (Nightingale & Hogg, 2003). Personal attributes, such as leadership and decision making, are seen as important qualities for the advanced practitioner (Snaith & Hardy, 2007). Advanced practioners are also involved with research and education (Nightingale & Hogg, 2003; Snaith & Hardy, 2007), service management and planning and are acknowledged for their expertise (Snaith & Hardy, 2007). Research is becoming increasingly important in the development of guidelines for extended and advanced practice to provide a base of evidence on which these guidelines are established as more often they are used in litigation (White & McKay, 2002).

Legal issues

The risk of litigation against MRTs, as extended practice develops, is of concern to both radiologists and MRTs (Yielder et al., 2008; Young et al., 2008). However other factors influencing a change towards a more litigous environment include patients having a greater expectation of higher quality service than in the past and being encouraged to complain openly about inadequate service, as well as the media publicising adverse events where health professionals lose public respect. This litigous environment is compounded by staff shortages and an increase in demand for services which increases the potential for mistakes to occur (White & McKay, 2002). In NZ the Accident Compensation Commission (ACC) provides for all people in New Zealand, a comprehensive, no-fault personal injury coverfor all accidental injuries including medical misadventure. If a case is accepted by ACC a patient loses their right to sue for damages (ACC, n.d.),however they can still lay a complaint with the Health and Disability Commissioner (HDC),which will need to be defended (HDC, 2009). The employer becomes involved under vicarious liability where they take on the responsibilty for the actions and any omissions of their employees (White & McKay, 2002). Whereas previously the Bolam test was used in such cases, there is increasingly a shift to the Bolitho test. The Bolam test compares the actions of the defendant to that which is in accordance with general practice as supported by a body of medical opinion (Smith, 2008). On the other hand, the Bolitho test uses guidelines and evidence based medicine (Alderson & Hogg, 2003; Buttress & Marangon, 2008; Smith, 2008).Under the Bolam test White and McKay

(2002) suggest that if MRTs take on tasks traditionally performed by radiologists then their actions would be gauged against that of a radiologist. However Alderson and Hogg (2003) suggest that a MRT would not be expected to have skills equal to that of a radiologist however the MRT should be able to recognise the limits of their expertise and know when to refer to a radiologist. Recognition of these limitationsshould be included in department protocols. Therefore the use of protocols and guidelines in the Bolitho test means the actions of the defendant may be shown to be rational, justified and supported by guidelines or protocols based on evidence from medical research (Alderson & Hogg, 2003; Buttress & Marangon, 2008; Smith, 2008). The use of protocols and guidelines in litigation further supports the need for MRTs to receive formal and standardised training and education for role extension so they understand the importance of following guidelines and protocols developed using evidence based medicine.

Support

Working in an environment that supports role extension is essential according to Smith and Reeves (2009). There are several issues that have been identified by literature in how support can be provided for MRTs who are engaging in role extension activities. Education and training can be supported by collaboration between educational providers and clinical departments. Work-based learning, where education and training are provided in the work environment, is one way how education providers and clinical departments can work together (Eddy, 2010). Work-based education allows for experiential learning where the student actively learns role extension tasks within the environment in which they will perform those tasks (Ferrara, 2010). However, according to Paterson el al. (2004) who identified resources required for providing a radiographer reporting service, a strong commitment from the department is necessary for work-based learning. That commitment may be demonstrated by providing support such as:access to a formal accredited reporting course; identifying other staff to mentor the student and provide tutorials; providing time to study; access to films for practice reporting; and time to attend clinics and case conferences. Problems identified were: lack of staff; students being unable to use the allotted study time (Eddy, 2010; Smith & Reeves, 2009; Young et al., 2010); competition from registrars; lack of peer support; differences in techniques of consultants (Eddy, 2010); lack of time with the radiologist (Young et al., 2008); the cost of setting up, maintaining the training programme and employing extra staff to cover the work not done by the student when training for role extension (Paterson et al., 2004). Support needs to continue after training as the radiographer gains more experience and becomes more confident in their extended role for example where a new reporting radiographer needs a workload that is achieveable in the time given, and the opportunity to consult more experienced staff (Paterson et al., 2004).

Summary

Role extension for health practitioners around the world grew out of a shortage of medical practitioners and an increase in demand for services. The type of role extension activities that were performed by health practitioners depended upon the local needs and demands. Nurses led the way in the 1960s with UK radiographers soon following. As the range of activities which were performed by practitioners grew, so did the need for education and training, however education opportunities were often haphazard, and training given was not necessarily appropriate for a specific role extension activity. The literature has demonstrated that support from a wide variety of areas was vital to enable health practitioners to confidently and competently perform role extension activities. Radiologists' support for radiographers was critical as some of the role extension tasks are roles the radiologist performs but delegates to other staff as their own workload increased. Educational providers needed to adapt their programmes to ensure undergraduate courses support students for future role extension activities and provide short courses or post graduate qualifications to underpin role extension. Support from management allowed funding for role extension training programmes and providing adequate staffing levels allowed the student time to up-skill. Professional bodies provided further support to ensure training was appropriate and guidelines or protocols were developed to ensure the health practitioners were working within legal boundaries.

Chapter 3: Research Procedures

Methodology

Survey research was the chosen research method for this dissertation. The description of survey research by Cohen, Manion and Morrison (2000) as being useful "to gather data at a particular point in time with the intention of describing the nature of existing conditions" (p.169) fits the aim of this research topic. Research such as this needs to be conducted prior to any formal recognition of role extension activities performed by MRI technologists in order to identify the type and extent of roles extension activities currently being performed. This survey was designed to collect information about which activities are and are not seen as part of the normal role of a MRI technologist, and opinions about the training provided. Survey research allows for the collection of data from a large number of participants. The results can then be generalised and applied to the whole cohort (Cohen et al., 2000). As this research project is a dissertation the use of the survey alone is more suitable where there is a need to have a well circumscribed topic rather than for a more complex research such as a thesis.

Data Collection

A written questionnaire was used to gather data for the survey. As suggested by Hinds (2000), a questionnaire is appropriate for this survey because information was collected from a specific cohort (MRI technologists) throughout New Zealand to enable generalisations to be made about role extension activities by MRI technologists. The information sought was simple as this research was seeking facts about the current status of role development and role extension activities in MRI. The study cohort was a well-educated group of people who were participating in, or have completed postgraduate education in MRI and are currently working in MRI.

An alternative to sending out written questionnaires would have been to use an internet survey tool such as Survey Monkey as suggested by one of the supervisors for this research. However, as there were difficulties in obtaining e-mail addresses for all MRI technologists it was decided to post out a written questionnaire. There were also difficulties in obtaining accurate numbers, names and addresses for MRI technologists as discussed below.

A questionnaire allows for both quantitative and qualitative data to be obtained (Hinds, 2000). Quantitative data was collected using closed questions. Closed questions provide background information along with specific information on role extension activities and the

training required to enable the MRI technologist to carry out those activities. Responses to closed questions can be pre-coded to allow for more efficient analysis (Hinds, 2000). To understand the effects on MRI technologists of performing these role extension activities and the training given, qualitative data was collected in the form of open questions. Open questions allowed the respondents to express their opinions about the training they had received and to identify areas where more support or structure was needed (Cohen et al., 2000). Allowing respondents to express their opinions will give some meaning to the activities and allow analysis of the information to determine what the future educational needs may be.

Study Participants

The study cohort included MRTs working in New Zealand who have a full scope of practice (SOP) or a training SOP in MRI as identified by the MRTB. In December 2006 Young (2008) identified a total of 128 MRI technologists from the MRTB register and surveyed 122 of these MRTs with a response rate of 75%. To allow for a possible increase in the number of MRI technologists it was anticipated that 120 to 130 questionnaires would be sent out and with hopefully a similar response rate of 75%. For a 60 credit dissertation these numbers were considered sufficient. In reality, determining an accurate number of MRTs holding a full or training SOP in MRI proved to be problematic. A review of the MRTB online register as of February 2010 revealed that there were at this time 174 MRTs registered with either scope. The accuracy of this information is in doubt as several SOPs of known MRTs were incorrectly documented. The register may also include those not actually practicing for reasons such as being on maternity leave or working overseas. Contact details or places of employment were not listed on the register for privacy issues. MRTs who had recently applied for a training SOP may also not have been included. Discussions with a fellow MRI technologist who had recently sent out a questionnaire showed she had sent out 157 questionnaires in total which was considered a more realistic figure to aim for. To obtain contact details MRI technologists known personally were contacted in the first instance, followed by contact by telephone with MRI sites to obtain the names of their employees. Addresses for these sites were obtained from a search on the internet or the latest Voxel, a directory which lists medical imaging providersin New Zealand (RANZCR, 2009). Some of the departments contacted would not give out individual names but did provide the number of MRI technologists working there. Because individual names were not obtained it is not known whether some MRI technologists were included twice as they worked for two different employers. In total 158 MRI technologists were identified, however another four were discounted as they were either involved in the research, on maternity leave or known to be leaving NZ.

Response Rate

In total 154 questionnaires were sent out by mail. Seventy-nine questionnaires were addressed to individuals and 75 were sent in bulk to departments. Eighty-eight questionnaires were returned. The return envelopes were coded to allow tracking to determine if those sent out in bulk reached the intended MRI technologists. To maintain anonymity the questionnaires were separated from the envelopes by an independent third party. Checking of the envelopes revealed that there was a higher return rate of the questionnaires sent to individuals compared to those sent in bulk to departments. Sixty-three percent (50 out of 79) of questionnaires were returned from those addressed to individuals, while those sent in bulk to departments resulted in a fifty percent return rate (38 out of 75). The total number of questionnaires returned was 57% (88 out of 154). A similar survey by Young (2008) had a higher response rate of 75% therefore the expectation was that the number of responses from this survey would be similar as both surveys were sent to the same cohort. Nevertheless, according to Babbie (1998) a 50% response rate is adequate whereas 60% is good for a postal questionnaire. This response rate is therefore a little better than adequate. Babbie (1998) suggests that it is more important to demonstrate a lack of bias in the answers than to have a good response rate.

Reliability and Validity

The reliability of the results depends upon the response rate and the honesty of the respondents in answering the questions. Research is more reliable if a larger percentage of the study group is sampled (Cohen et al., 2000). Because of the relatively small size of the study group, all MRTs within the cohort were sent questionnaires. Thirty-seven percent of those who responded reported their workplace as a public hospital, while 55% worked in a private practice. This correlates with the 2009 Health workforce annual survey (Ministry of Health, 2009) of 38% and 54% respectively. The gender of the respondents was also comparable to all NZ MRTs who answered the workforce survey with 86% female in this research compared to 85.6% for the workforce survey. These similarities in the results may indicate similar reliability levels of the surveys, however the MOH survey was sent to all MRTs, whereas the survey for this research project was only sent to those with a SOP in MRI. While the response rate was not as high as expected, the group who responded to this questionnaire, is believed to be representative of the whole cohort, therefore the results may also be applicable to the whole cohort.

To ensure the validity of the research, the questionnaire was reviewed frequently as it was being developed to ensure the questions would elicit responses relevant to the aims of this research. As recommended by Cohen et al., (2000) and Hinds (2000), the questionnaire was

developed and the research supervisors were asked to review it prior to distribution. One of the research supervisors trialed the questionnaire and provided feedback. As a result of the feedback minor changes were made to the lay out of the questionnaire along with alterations to questions four and six. Question four asking “with which education provider are you or were you enrolled to complete your postgraduate qualification?” had another option of Competency Based Assessment (CBA) or Registration Examination Assessment (REA) added to the list of possible answers. Question six had the list of types of workplace simplified to four options instead of six. Once final approval was received from the research supervisors the questionnaire was distributed.

The questionnaire

There were three parts to the questionnaire (see Appendix 1) which was posted out with a covering letter (see Appendix 2) which explained the nature of this research, voluntary participation and anonymity of the results and contact details. The first part aimed to gather background information about the individual respondents and their work environment. There were nine closed format questions and one open format question. Respondents were given options to tick in response for the closed format questions. Part two investigated work activities. As this research was investigating several types of activities, questions included tables where the activities were listed and the respondent either circled an answer or ticked a box. This meant there would be information about a variety of activities gathered for each question. Using closed questions allowed for easier coding of the answers (Hinds, 2000). Open and closed questions were also used in the third part of the questionnaire which investigated the respondents’ training and education. Along with a table or list of activities with options for the respondent to tick, space was also provided for written comments. These open questions allowed the respondents to express their opinions about their training and education and elicited further comments (Cohen et al., 2000).

To encourage responses the questionnaire was structured in a way which was easy to follow and quick to answer along with a covering letter clearly explaining the reason for this survey and the perceived advantages to individuals and the profession as a whole (Hinds, 2000). A stamped, self-addressed envelope was included, along with a date for the return of the questionnaire. Return envelopes were coded according to the address they were mailed to. Coding of the envelopes was to track where the responses came from to determine if there were differing rates of response depending upon whether the surveys were sent to individuals or in a bulk mail out to departments.

Data analysis

Responses for the quantitative data obtained were recorded on an Excel™ spread sheet. Univariate analysis on the background demographic questions provided descriptive information about the respondents (Babbie, 1998). Bivariate analysis was used to compare different groups within the cohort (Babbie, 1998), such as comparing the role extension activities performed by MRI technologists in a private practice to those in a public hospital to assess if the different groups have different needs. The answers to the open questions were analysed for themes and coded as appropriate. As the themes emerged there was the challenge to remain open to different themes and not to align them to any preconceived outcomes (Cohen et al., 2000).

Ethics

The covering letter (see Appendix 2) accompanying the questionnaire was included explaining the purpose of the surveyand any expected benefits. Any risks were acknowledged along with the acknowledgement that the answering of any or all of the questions was voluntary. Informed consent was considered to have been given when the questionnaire was completed and returned. The responses to the questionnaire remained anonymous as the unmarked questionnaires were separated from the return envelopes after the return date by an independent third party.

As the MRI technologist population in New Zealand is relatively small, there may be a higher risk of being able to identify the respondents or their place of work. All efforts were made to ensure no person or place of work was identified in any published results. Participant confidentiality was maintained.

My contact details, along with those of my supervisor, were included on the covering letter so participants could contact me directly if they had any questions.

Only one respondent contacted me with a question about my definition of supervision, to which I replied that it was noted on that particular question.

Evaluation of the questionnaire

Initially there were some problems structuring the questionnaire where the same question was asked about several different role extension activities. Presenting a questionnaire that was too long may have deterred some MRI technologists from responding to it, therefore a table format was used, so the question was asked once and the respondent could tick a box to indicate the answer to each activity. This worked reasonably well, however it was felt

some respondents looked down the list and just ticked without really reading it because some answers for one question did not correlate with their answers for another question. In other questions several respondents wrote comments where they were not asked for, however they did provide some information which is noted in the results section.

Another problem which became evident when recording the results to Question 12, (which asked who performs which role in their department), was that some respondents selected more than one option. As this question was looking for information about supervision levels, the first or lowest level was recorded. For example if a respondent indicated that a particular activity was performed by a MRI technologist 'unsupervised' and 'supervised by a radiologist' the result was recorded as 'unsupervised.' The results for an activity performed by a MRI technologist 'unsupervised' or 'supervised by a MRI technologist' were combined, as the activity was still at times unsupervised by a radiologist. The interpretation of the term supervision for Question 12 was deliberately only loosely defined as 'Radiologist on site' so as to gain an indication of the MRI technologists' perception of radiologist supervision. 'Radiologist on site' could be interpreted as direct supervision or the radiologist in the MRI department or somewhere else on site.

One activity the respondents were asked to comment on was the administration of other drugs with examples of other drugs given as buscopan (a transient antispasmodic) and hypnoval (a sedative). Some respondents indicated they administered one specific drug and not others. These comments were noted in the results section and included in the general discussion.

Summary

The use of a questionnaire for this research was appropriate for the information that was being sought as information relevant to the research question was received. Data collection was both qualitative and quantitative which provided numbers of MRI technologists performing specific role extension activities and their opinion about the adequacy of any training they had received in order to perform the extended tasks. The response rate of 57% was 'a little better than adequate' and has allowed results to be generalised to the wholegroup. There were no significant ethical issues and participant anonymity and confidentiality were maintained by using response sheets that did not request respondent identification. Data analysis was straight forward with themes emerging from the results, as shown in Chapter 4, with a discussion of these themes in Chapter 5 and conclusions in Chapter 6.

Chapter 4: Results

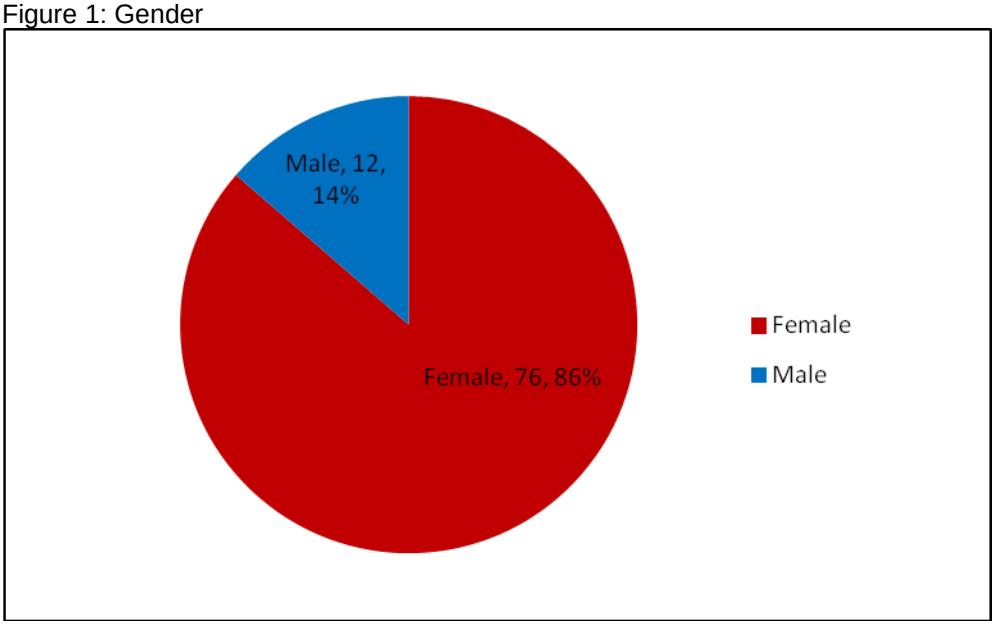
Introduction

This chapter reports the results of the questionnaire used for data collection for this dissertation. In total 154 questionnaires were sent out, with 88 returned by the closing date. This constitutes a 57% response rate. Not all questions were answered by each respondent which is noted as 'did not answer' (DNA) in the results for each question. The results were separated into three parts in keeping with the questionnaire. Part one provides background information about the respondents themselves and their work environment; part two provides information about their work activities; while part three provides information about their training and education for the work activities they perform along with their opinion about the adequacy of their training. The results to each question were entered into an Excel™ spread sheet with graphs or tables produced and are presented as per the questionnaire with graphs or tables as appropriate.

Part One: About you and your workplace.

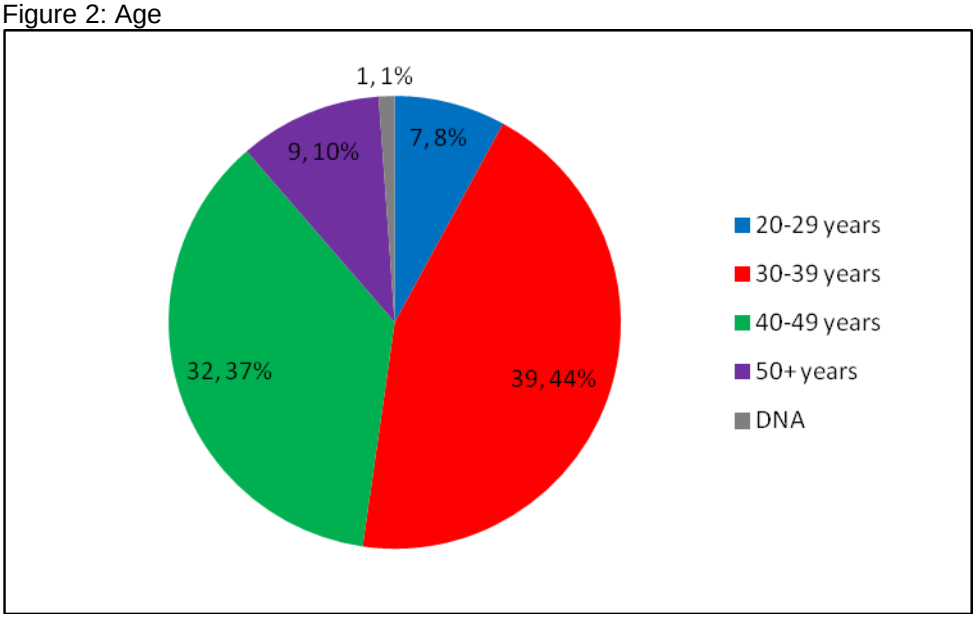
Question 1: You are: female or male?

Figure 1: Gender



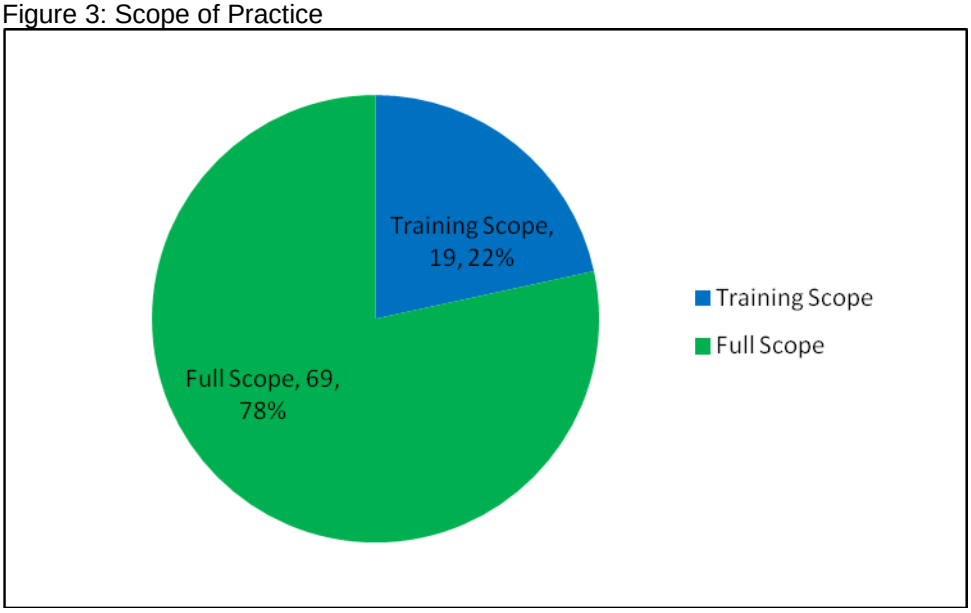
Question 2: Age

Figure 2: Age



Question 3: What type of scope of practice do you hold in MRI: Training MRI; or full MRI?

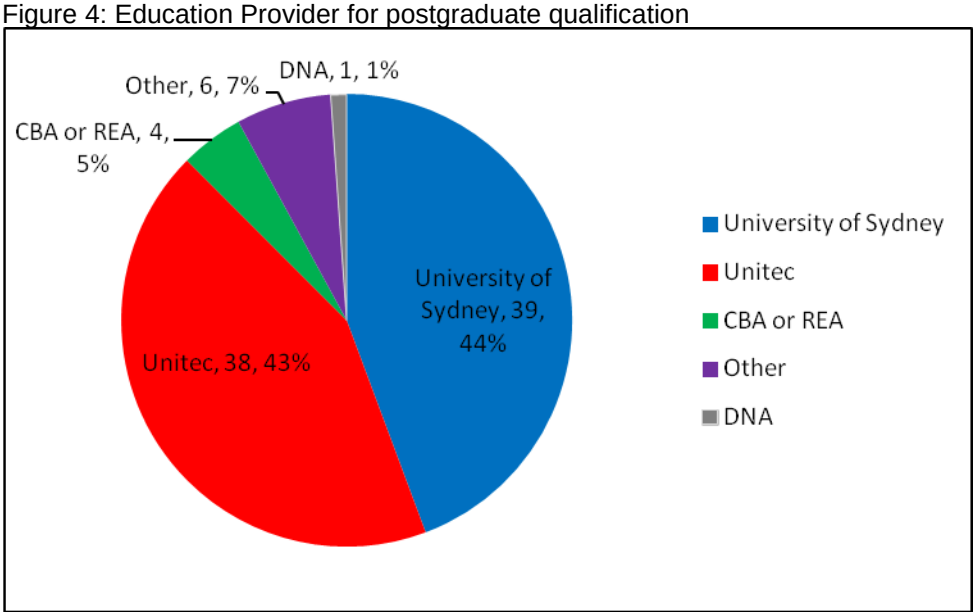
Figure 3: Scope of Practice



Question 4: With which education provider are you or were you enrolled to complete your postgraduate qualification: University of Sydney; Unitec; Not applicable i.e. CBA or REA; or Other?

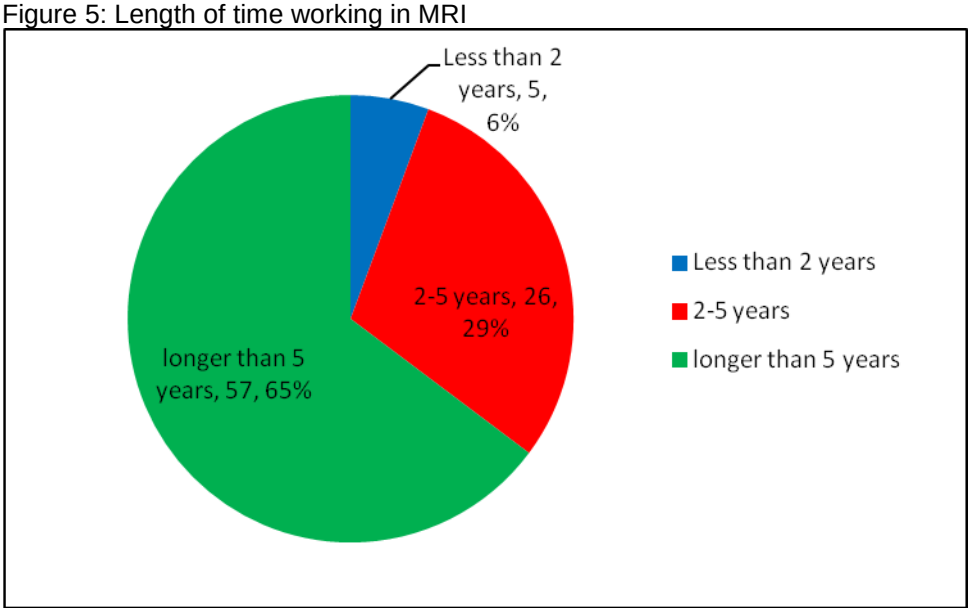
CBA and REA are pre-registration assessments for MRTs who do not have a post graduate qualification recognised by the MRTB but have significant clinical experience in MRI. By sitting and passing a CBA or REA the MRT is granted registration without the need for obtaining an applicable post graduate qualification.

Figure 4: Education Provider for postgraduate qualification



Question 5: How long have you been practicing MRI: Less than 2 years; 2 to 5 years; or longer than 5 years?

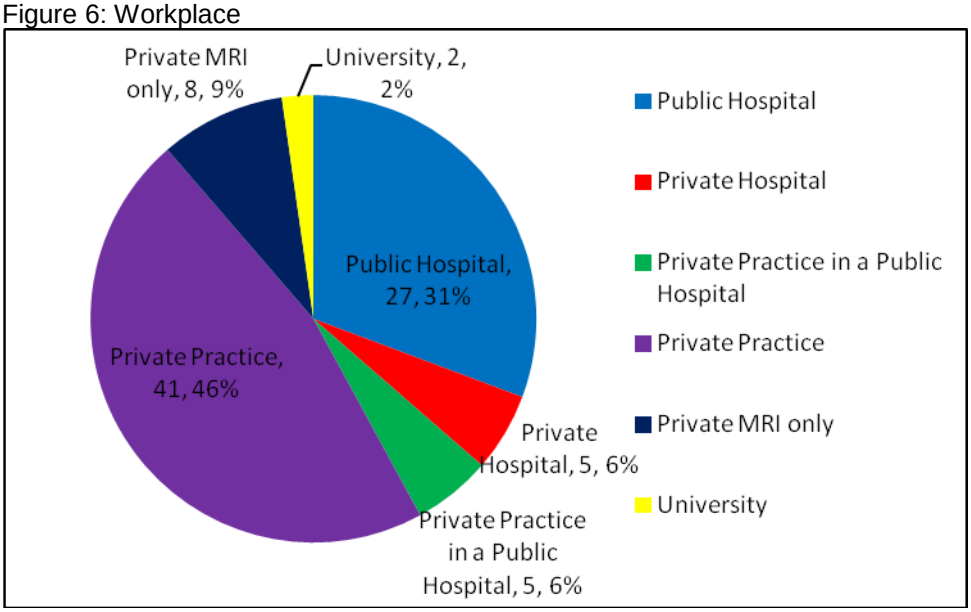
Figure 5: Length of time working in MRI



Question 6: How would you best describe your workplace: based at a public hospital; based at a private hospital; based in a private practice that offers other imaging modalities; or private practice that only offers MRI?

Some respondents indicated other options such as a private practice in a public hospital and a university. These options are included.

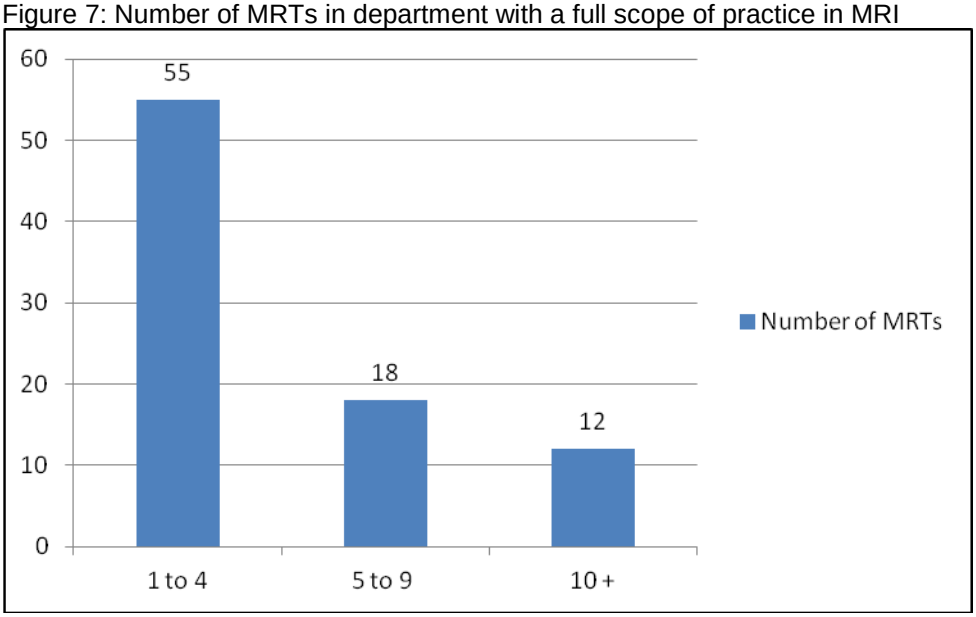
Figure 6: Workplace



Question 7: How many MRI MRTs work in your department with a full SOP?

Three respondents did not answer this question. Most respondents reported they work in a small department with up to four MRI technologists with a full scope of practice.

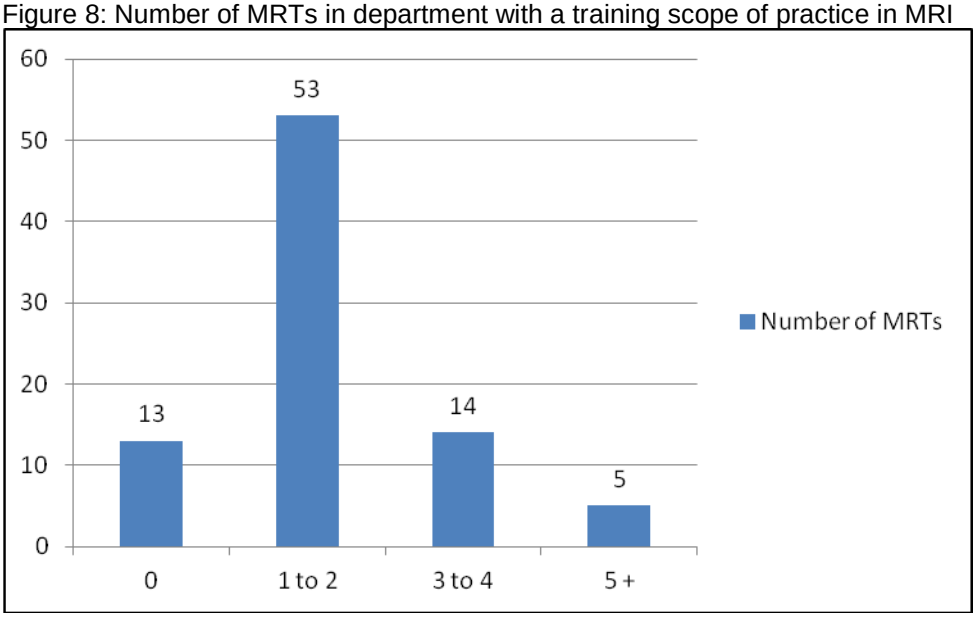
Figure 7: Number of MRTs in department with a full scope of practice in MRI



Question 8: How many MRI MRTs work in your department with a training SOP?

Three respondents did not answer this question. Most respondents work in departments where there are one or two trainees.

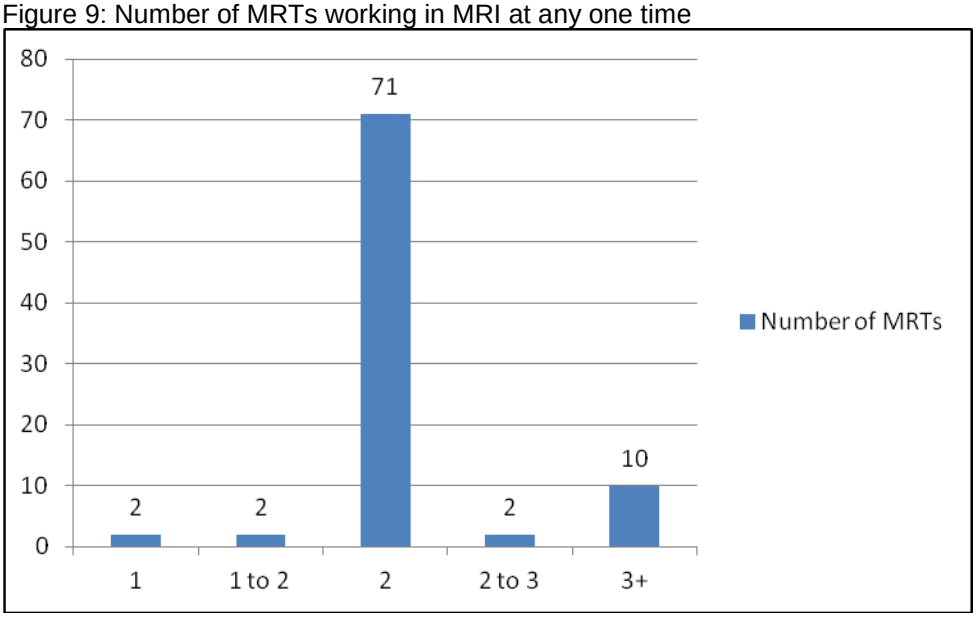
Figure 8: Number of MRTs in department with a training scope of practice in MRI



Question 9: How many MRI MRTs routinely work at any one time in your MRI department?

One respondent did not answer this question.

Figure 9: Number of MRTs working in MRI at any one time



Question 10: What is your job title?
The answers to this question were separated into terms and listed with the frequency of use shown in Table 1. The most common term used is MRI MRT.

Table 1: Showing the titles used to describe the respondents job title.

Title	**Frequency**	**Title**	**Frequency**
MRT	48	Senior	5
Tech	9	Charge	14
Radiographer	6	Grade	2
Technologist	15	Specialist	1
Technician	4	Team Leader	2
Student/trainee	4	Deputy Charge	1
Staff	18	Branch Manager	1
MRI	66	Site Supervisor	1

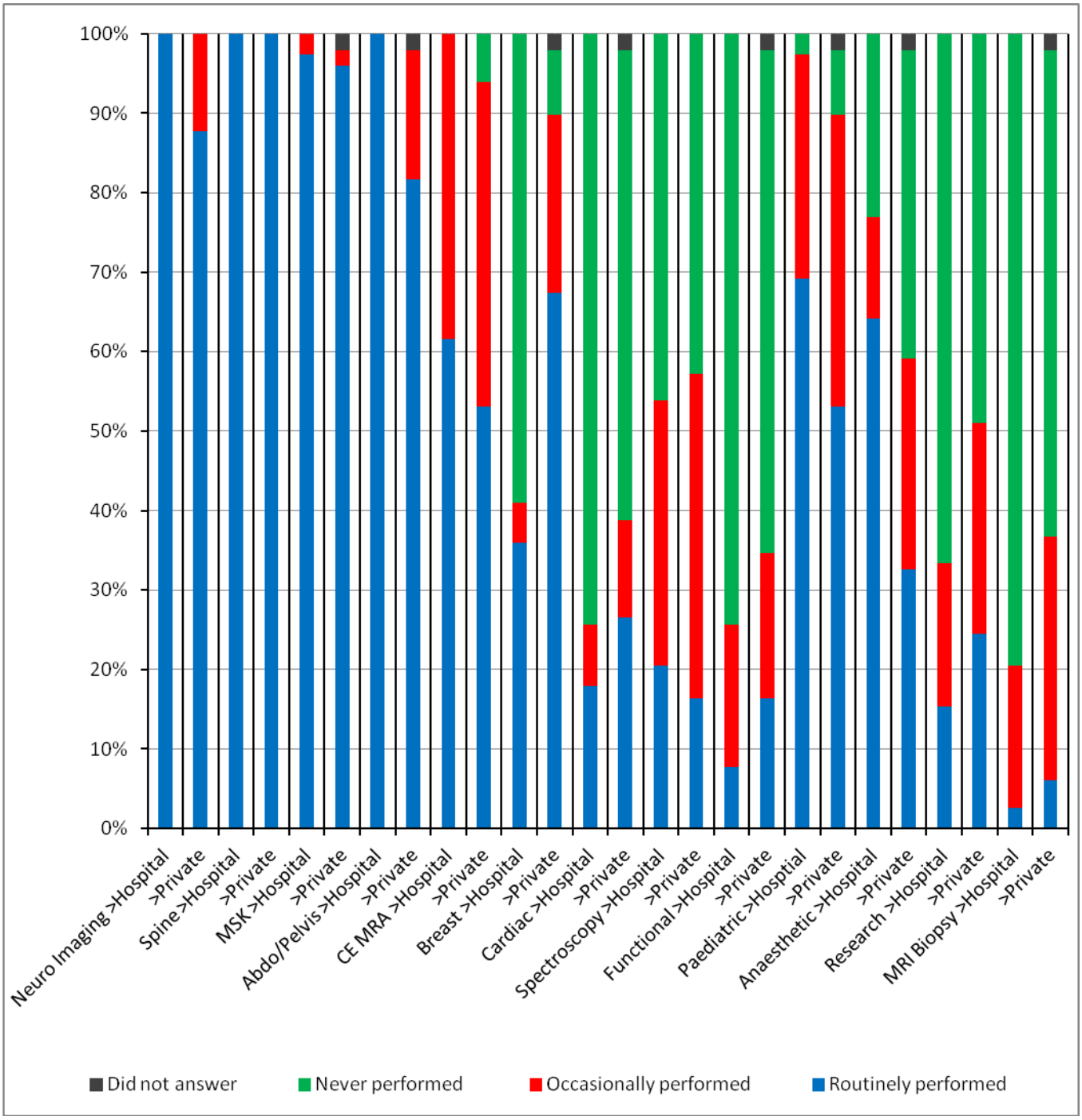
Part two: Your work activities.

Question 11: How often are these scans performed in your department? Routinely, Occasionally, Never

'Routine' was described as more than once a month on average over the last year; 'occasionally' as less than once a month on average over the last year; and 'never' as not performed. The answers were separated into hospital and private practice categories and compared to assess whether working in a hospital or private practice changed the type and frequency of scans performed. Thirty-nine of the 88 respondents reported working in a hospital and 49 in a private practice. Answers are presented as a percentage for each group (i.e. public hospital out of 39, private out of 49) on the graph Y-axis, with the actual numbers on the bars. Based on the percentages of the results, scans most commonly performed in both public and private facilities included neurological, spine, MSK and abdominal/pelvis imaging. Breast MRI is more likely in private with anaesthetised and paediatric scans more likely in to be performed in public hospitals. Of the less widespread scans, biopsies, functional and cardiac MRI were more likely to be performed in private, and spectroscopy, slightly more likely in public hospitals. The results therefore indicate there is a core set of MRI examinations that are performed to some extent in all departments with all types of scans listed performed by varying amounts in both public and private facilities. However, this is only an indication as individuals were surveyed and not departments.

The chart below (Figure 10) displays two bars for each of the listed examinations: one each for hospital and private departments. Blue represents the departments where it is reported that the examination is performed routinely, while red shows where it is occasionally performed. Green indicates the examination is not performed. From this it can be readily identified in which departments the examinations are more likely to be performed and those examinations such as neuroimaging, spine, MSK and abdomen and pelvis, which are core examinations performed in all departments to some extent.

Figure 10: Type of examination and how often performed



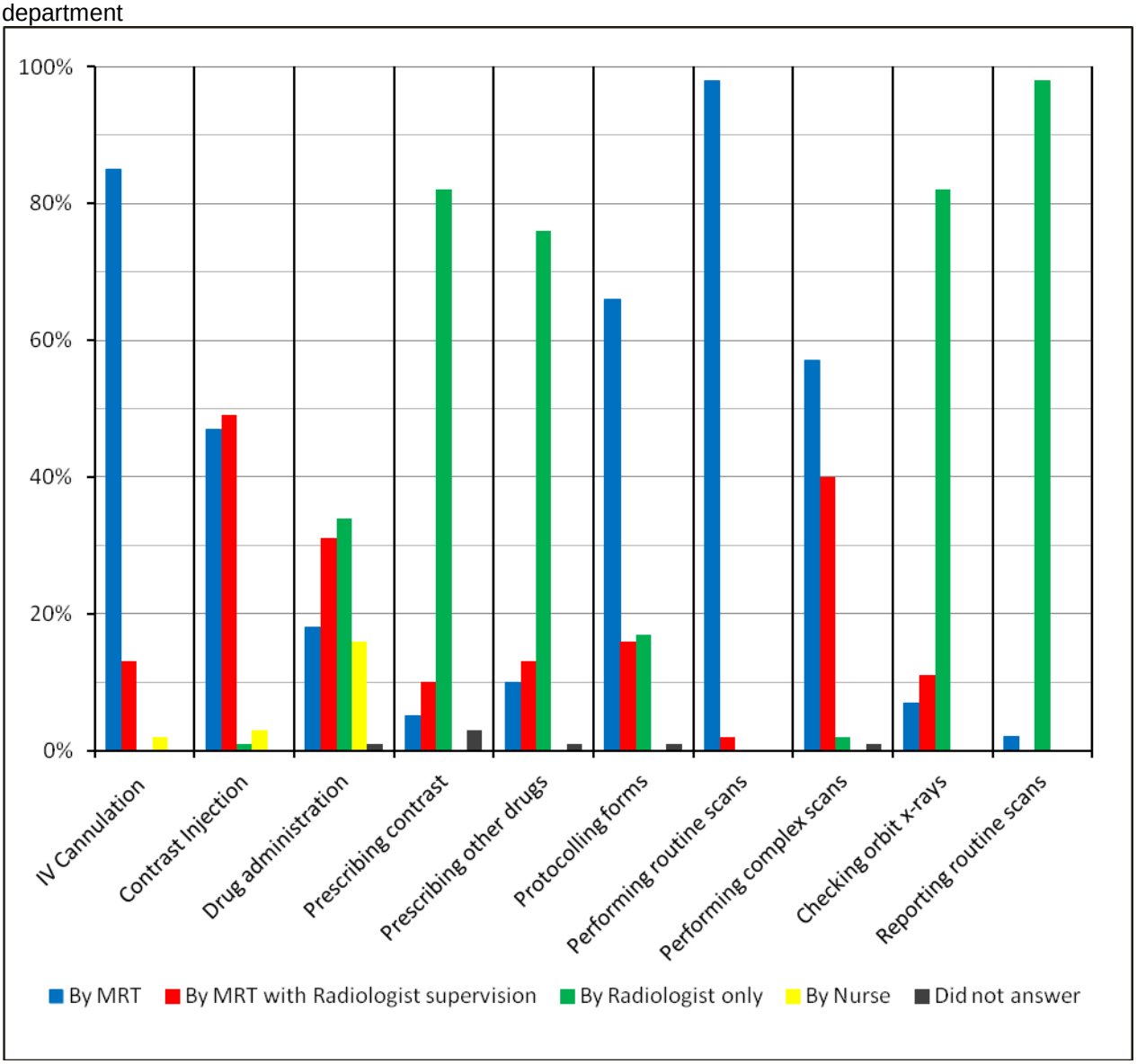
Question 12: Please indicate the roles that are performed in your department and by whom:

- *by MRI MRT unsupervised;*
- *by MRI MRT supervised by senior MRI MRT;*
- *by MRI MRT supervised by radiologist;*
- *by radiologist only.*

Radiologist supervision was defined as 'Supervised by a radiologist on site.'Some respondents indicated two answers to this question that of 'MRI MRT unsupervised' and 'supervised by a senior MRI MRT'. These two responses were combined to become 'by MRT' as ultimately a MRT was performing the task and was not being supervised by a radiologist. Respondents also added another category of 'Nurse'. This was seen to be notable and indicates when a nurse routinely performs an activity that is not performed by a MRI technologist.

The activities included are: IV cannulation; contrast injection; administration of other drugs; prescribing contrast; prescribing other drugs; protocolling forms; performing routine scans; performing more complex scans; checking plain x-rays for metallic intraocular foreign bodies; and reporting routine scans. The result for each activity is shown on the graph for comparison followed by comments for each activity .

Figure 11: Which activities are performed and by whom in department



IV Cannulation

Ninety eight percent of respondents reported MRTs performed IV cannulation in the department they work in either unsupervised (85%, N=75) or supervised by a radiologist (13%, N=11). No one reported IV cannulation is a radiologist only activity however 2% (N=2) reported it was the responsibility of a nurse in their department.

Contrast Injection

Ninety-six percent of respondents reported MRTs performed contrast injection in their department either unsupervised (47%, N=41) or supervised by a radiologist (49%, N=43). One percent of respondents reported contrast injection was the responsibility of the radiologist and another 3% (N=3) reported it was a nurse's responsibility.

Drug administration

Just under half of all respondents reported that MRTs administer other drugs relevant to the procedure either unsupervised (18%, N=16) or supervised by a radiologist (31%, N=27). Another 34% (N=30) reported it is the responsibility of the radiologist with another 16% (N=14) reporting it is the responsibility of a nurse. One did not answer. The type of drug and method of administration was not specified, however buscopan and hypnovel were given as examples. Sixteen percent of respondents (N=14) clearly indicated buscopan only was administered by MRTs in their department.

Prescribing contrast

Eighty two percent of respondents (N=72) reported prescribing contrast was only performed by a radiologist, while 10% (N=9) performed this activity under the supervision of a radiologist and 5% (N=4) by a MRT. Three percent (N=3) did not answer. Some respondents indicated contrast was part of the protocol for certain examinations and clinical indications, therefore was given routinely for those examinations.

Prescribing other drugs relevant to the procedure

Ten percent of respondents (N=9) indicated that MRTs prescibe other drugs relevant to the procedure, while 13% (N=11) do this under radiologist supervision and 76% (N=67) reported this was the radiologist's responsibility. The MRTs who reported they prescribe other drugs qualified this by stating they only prescribe buscopan as it is written in their protocols.

Protocolling forms

Protocolling forms was reported by 66% (N=58) percent of respondents as being performed or supervised by MRTs, with 16% (N=14) radiologist supervised and 17% (N=15) the

responsibility of the radiologist. Some of the respondents indicated two levels for protocolling forms: routine requests which were protocolled by MRTs; and non-routine or more complex requests which were protocolled either by a MRT under supervision of a radiologist or by the radiologist.

Performing routine scans

All respondents indicated routine scans are performed by MRTs with 98% (N=86) doing so unsupervised and 2% (N=2) supervised by a radiologist.

Performing complex scans

Ninety-seven percent of respondents indicated that more complex scans are performed by MRTs with 57% (N=50) doing this unsupervised and 40% (N=35)supervised by a radiologist. Only 2% (N=2) of respndents indicated more complex scans are performed by the radiologist. One percent (N=1) did not answer.

Checking x-rays for metallic foreign bodies

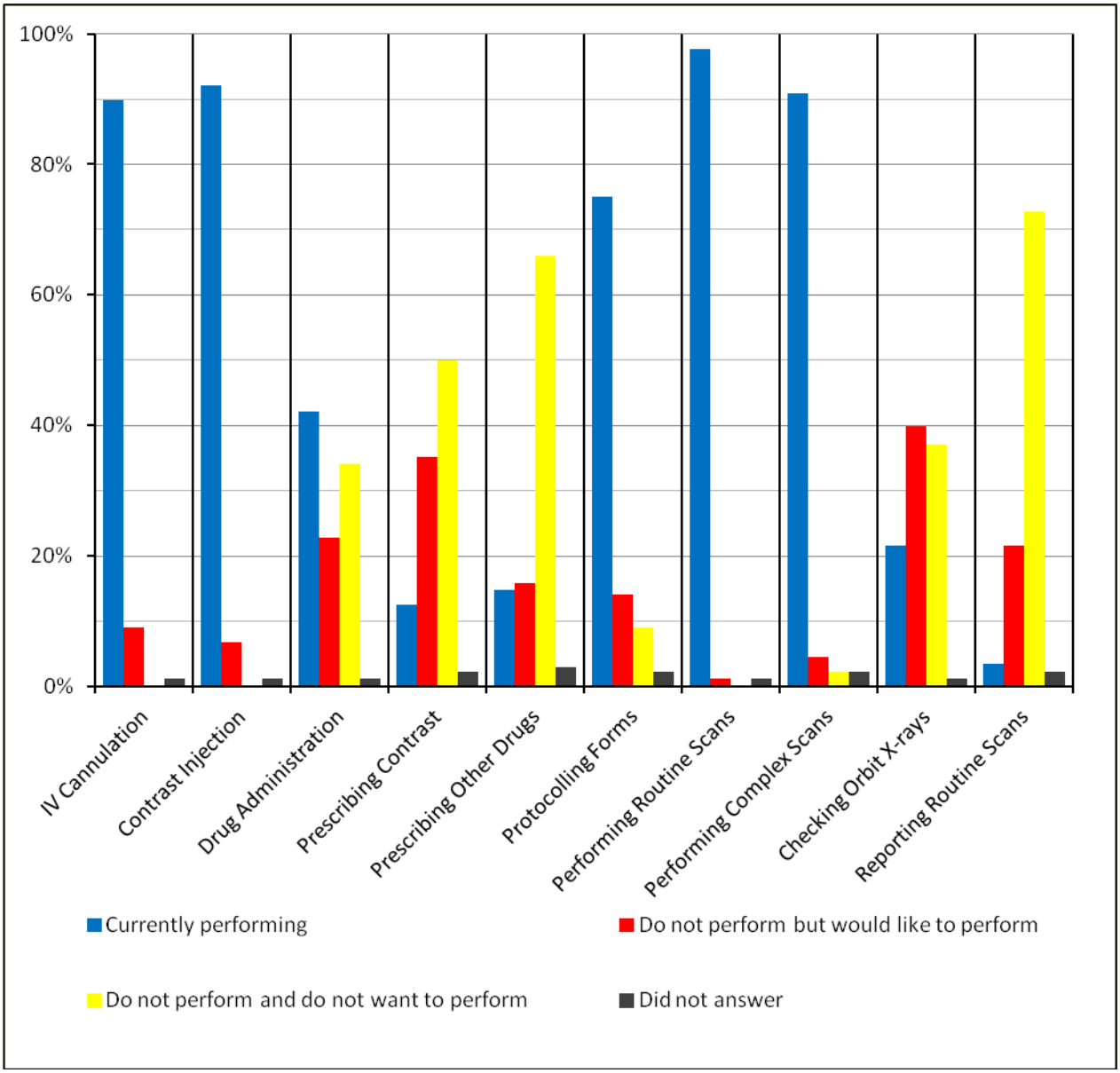
Checking x-rays for metallic foreign bodies is a radiologist task according to 82% (N=72) of respondents. Eighteen percent of respondents reported MRTs perform this activity with 7% (N=6) performing it unsupervised and 11% (N=10) supervised by a radiologist.

Reporting routine scans

Ninety-eight percent of respondents (N=86) indicated reporting routine scans was performed by radiologists in their department. Two percent of respondents (N=2) indicated MRTs report routine scans, however those respondents are not the ones performing this activity. Those same respondents indicated for the next question (13) that this was not an activity they were currently performing. For further discussion on this result see question (13).

Question 13: Please indicate by ticking the boxes below which activities listed below you currently perform, those you would like to perform and those you do not want to perform.

Figure 12: Activities and the percentage of respondents who are currently performing them, would like to and does not want to.



In answering parts of this question about the administration and prescription of drugs relevant to the procedure, some respondents who'currently' or 'would like to perform' these tasks stipulated that it would be for buscopan only. Another respondent commented they "do not prescribe as in charting but do decide whether we give it."

Reporting routine scans

The accuracy of the results of this question about 'reporting routine scans' is questionable. As three respondents indicated that they currently report routine scans, however those same

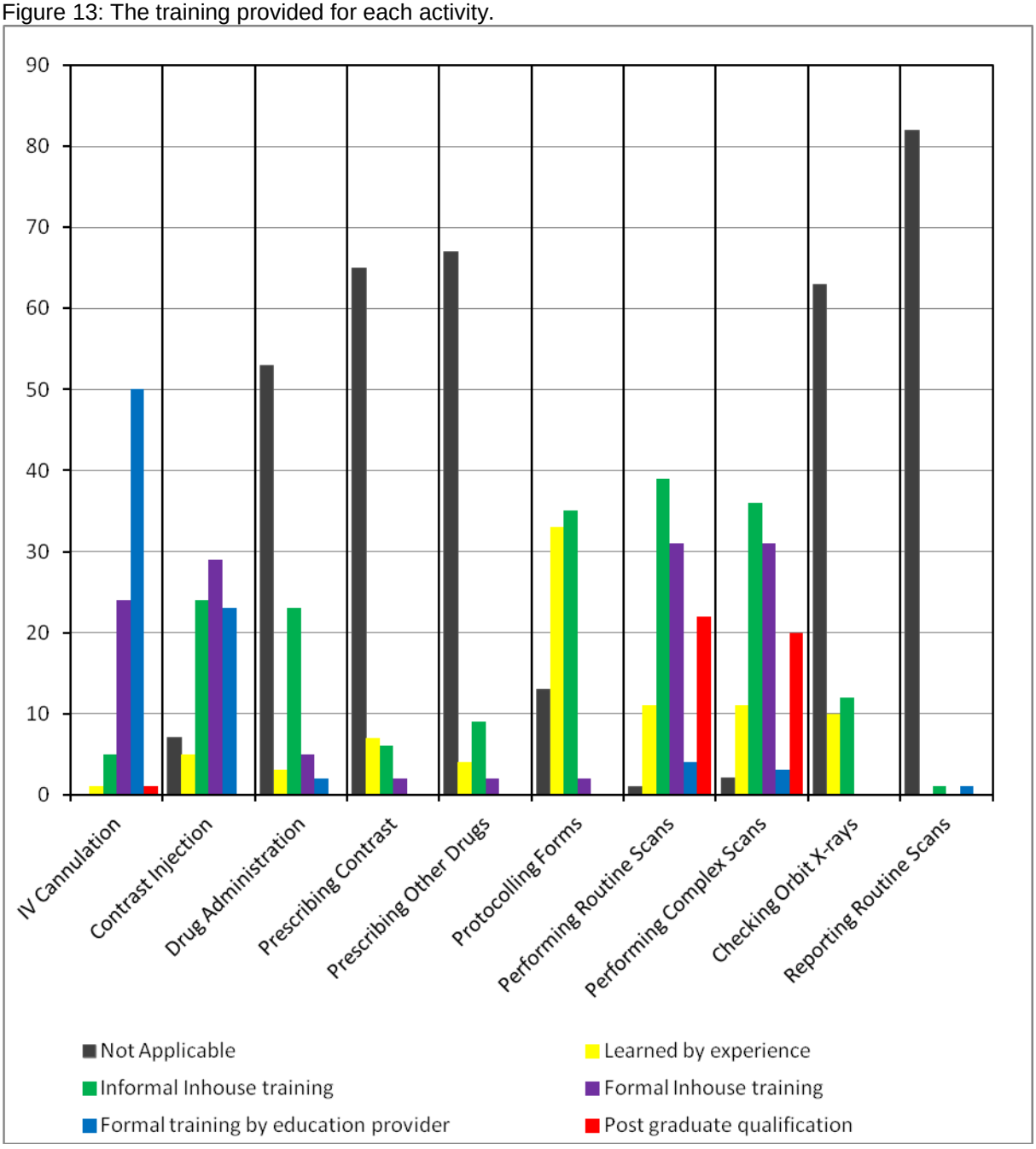
respondents' indicated for the previous question (12) that reporting of routine MRI scans was performed by the radiologist only in their department. Further, the two respondents who responded for the previous question (12) that MRI technologists reported routine scans in their workplace indicated they do not currently perform that activity. This could be because the MRI technologists who are reporting routine scans did not respond to this questionnaire or that there are not any reporting MRI technologists in New Zealand.

Part three: Your training and education

Question 14: What training and/or education were you given for each role extension activity you perform?

Respondents were asked to answer this question only for the roles they currently perform. Not all of the respondents answered this question and some of those who did gave more than one answer. The values shown are the actual number of responses for each activity. The option 'not applicable' could have been interpreted in two ways: training is not needed; or does not apply to the respondent as they do not perform this activity. In this instance the latter interpretation is applied.

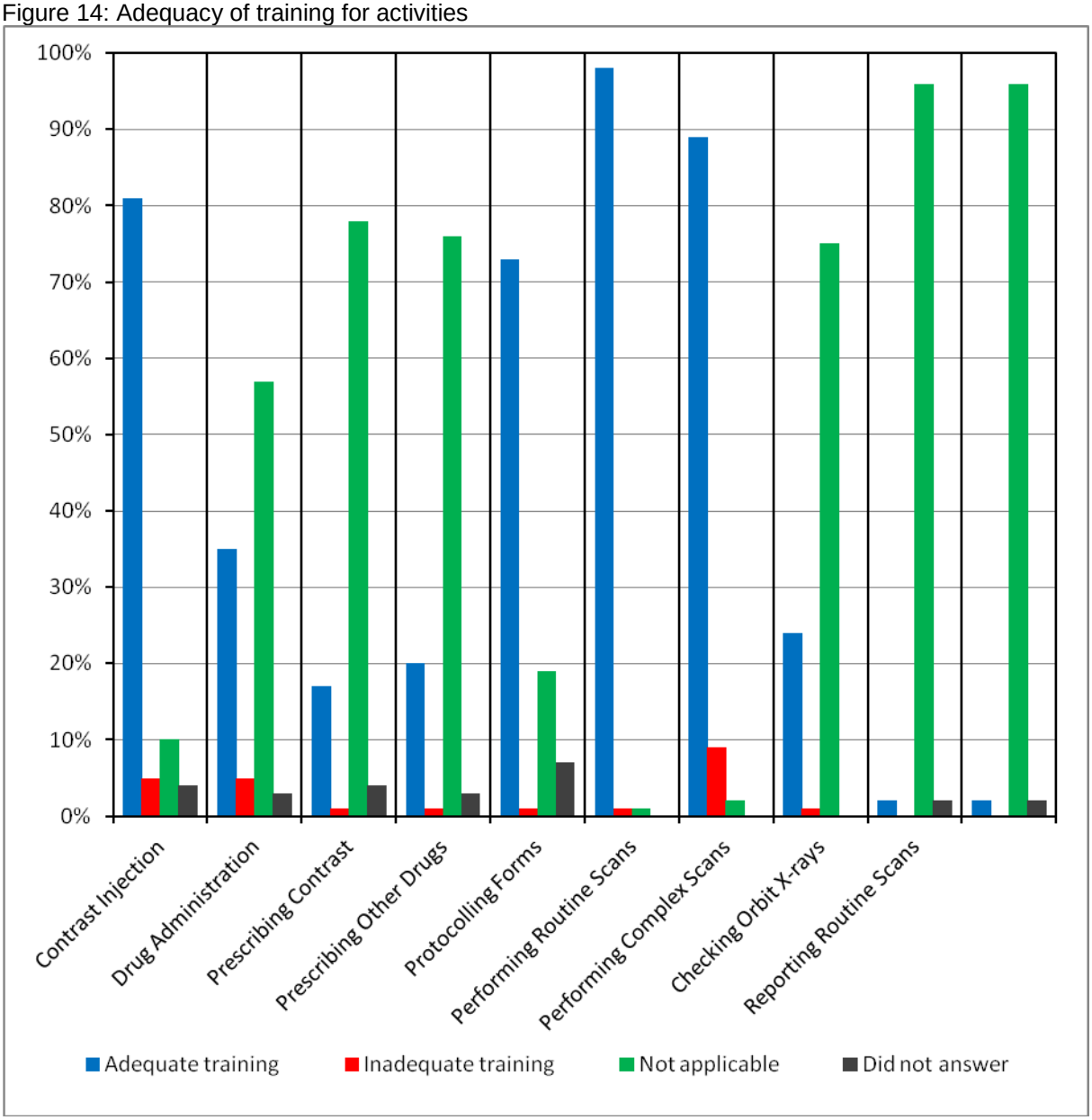
Figure 13: The training provided for each activity.



Question 15: Please tick the box to indicate if you felt the training and/or education was adequate or not. If you answer inadequate to any activity please explain why it was and what you would like to see happen to improve the training in the space provided.

Some respondents commented on activities even though they indicated their training was adequate. Comments are grouped together in themes and follow each graph.

Figure 14: Adequacy of training for activities



Contrast injection

There were five comments from respondents. Two indicated they would like more training on allergic reactions/anaphylaxis and what to do. One commented their training course was “not very good, however they learnt more on the job with supervision.” Another respondent indicated they had “training for x-ray contrast but not for MRI contrast,” while another stated “when I trained 20 years ago there were no academic qualifications available for MRI or

associated roles. Contrast injecting was learnt 'on the job' with no supporting theory - I have been injecting for IVP/CT and MRI for approximately 17 years."

Drug administration

Six comments were made regarding the administration of other drugs. Those who commented made a differentiation between buscopan and drugs used for sedation, while two indicated a difference in the type of administration of drugs – oral or IV. Four stated they administered buscopan only, and not hypnovel. How buscopan was administered to the patient was not stated although one respondent commented that the radiologists did not want them to inject buscopan because of possible complications. One commented they did not administer hypnovel however they did administer Ativan. It is assumed hypnovel in this case may be administered via an IV while Ativan is given orally. Four respondents indicated their training was inadequate and this was supported by three comments indicating they would like more formal training.

Prescribing contrast

Two comments were made regarding prescribing contrast. One suggested the need for pharmacology training while the other indicated there was nothing definite to determine when contrast was required as different pathologies require contrast injection and it varies with radiologist.

Prescribing other drugs relevant to the procedure

Three different comments were made regarding prescribing other drugs. One suggested the need for further pharmacology training, one stated "not hypnoval" while the other stated "although we do not prescribe as such, we know all female pelvic scans require buscopan & will give without radiologist."

Protocolling forms

There were four comments from respondents regarding protocolling forms. One stated they "don't 'officially' protocol forms but they do decide whether or not a patient is scheduled for a supervised session" while another stated they "scan unprotocolled forms after hours when there are no doctors around" and they also "guide junior registrars with protocol." This is learnt 'by experience' (2) with one respondent stating there are group meetings with MRI MRTs and radiologists to standardise protocols.

Performing routine scans

Two comments were received regarding performing routine scans. One respondent who had worked in different departments indicated that there was a six-week in house programme, while at their current workplace the training is “as long as it takes with no real pressure.” The other comment from a more experienced MRI MRT stated “20 years ago the expectations of the MRI technologists were quite different to the role and subsequent demands now. MRI technologists are a lot more autonomous now even in comparison to 5 years ago so a formal standardised national programme of training should be established with specific supervisory requirements and audit of competence.”

Performing more complex scans

Four comments were made about the training received for performing complex scans. Training tended to be by observation and scanning (2). One felt they were let down by this as early on in their training there was a lack of structure which did not meet their needs, while another two comments indicated the need for more training.

Checking orbit x-rays for metallic foreign bodies

Two of the three comments about checking orbit x-rays indicated they were MRTs with over 20 years of experience, and could do this with no extra training. The other respondent commented they would like a formal training session with a radiologist for identifying foreign bodies in orbits.

Reporting routine scans

Two commented extra training would be required to report routine scans, however one would not do this because the radiologists would not allow it, while the other could not face the training.

Question 16: Of those roles you currently do not perform, but would like to perform, what type of training and/or qualification would you like to be available?

Comments from respondents were grouped into common themes.

IV cannulation

- in-house training is available for IV cannulation (6)
- one respondent was happy with the training they have received

- one respondent was not happy with their training, saying their training was more related to nursing and fluid therapy. Would prefer a one day course with practical supervision

Contrast injection

- in-house training is available alongside IV cannulation training (7)
- education should cover contrast reactions, nephrogenic systemic fibrosis (NSF) and renal function (1)

Administration of other drugs

- respondents supported some form of formal training (16)
- in-house (8)
- provided by an education provider (3)
- that protocols or guidelines would need to be established (3)
- with certification (1).

Prescribing contrast

- formal training (15)
- in-house (9)
- education provider (7)
- certification (2)
- post graduate qualification (1)
- prescribing contrast is the radiologists' responsibility (2)
- in 99% of cases the MRT knows when contrast is required but just needs the radiologists' approval (1)

Topics to be covered by education include: pharmacology; NSF; chronic and acute renal failure; medication for contrast reactions; pathology identified by contrast; and the appropriateness of different contrast agents.

Prescribing other drugs

- formal education (10)
- In-house training (6)
- education by an education provider (6)
- certification should be required (1)
- training for buscopan (1)

Topics to include: contraindications; allergic reactions; and pharmacology.

Protocolling forms

- MRI technologist with experience and in-house training can protocol forms (16)
- training and support by a radiologist (8)
- formal training (2)
- formal education, with protocolling forms covered by the post graduate diploma (1)

Performing routine scans

- in-house training (1)

Performing complex scans

- in-house training (6) for performing complex scans with two specifying formal training (2)
- sharing of knowledge by spending time in another department (1)
- sharing of knowledge with formal user meetings (1)

Checking plain x-rays for metallic intraocular foreign bodies

- is the responsibility of the radiologist (34)
- in-house training (18)
- Formal training (14)
- By an education provider (10)
- an experienced general diagnostic MRT could perform this activity without further training (2)
- Postgraduate course (1)
- Certificate (1)

Topics suggested to be covered by training include: what to look for and criteria to check off, correct angulation and differentiation between artefact and foreign body.

Reporting routine scans

- Formal education by an education provider (24)
- Postgraduate qualification (7)
- Supported by in-house training (7)
- Are interested, would need more training, too busy scanning anyway (1)
- Is the radiologist's responsibility (1)
- this was unlikely to happen in private practice in NZ as there were too many radiologists (1)

Summary

The results from this questionnaire show New Zealand has an experienced group of MRTs working in MRI with two thirds of respondents reporting they have worked in MRI for over five years. More MRI technologists who responded to the questionnaire work in private MRI facilities than the public hospital system. All types of scans are performed in both private and public departments with neurological, musculo-skeletal (MSK), and abdominal/pelvic imaging being more widespread. Types of scans performed by some departments are breast, anaesthetised and paediatric scans. Only a few departments are performing biopsy, functional, cardiac MRI.

MRI technologists are performing role extension activities to varying degrees. Almost all of the respondents reported they perform IV cannulation, contrast injection, routine and more complex scans. Over half of the respondents are administering other drugs relevant to the MRI procedure and protocolling forms. Prescribing contrast and other drugs, checking orbit x-rays for metallic foreign bodies and reporting routine scans are the responsibility of the radiologist however some respondents did indicate they prescribe contrast and buscopan and some noted this was as per departmental protocols.

Supervision levels for the various activities vary with MRI technologists more likely to perform IV cannulation and routine scans unsupervised. Injecting contrast, the administration of other drugs and performing more complex scans are usually supervised by a radiologist.

Almost all MRI technologists who responded to this survey are currently performing or wanting to perform IV cannulation, contrast injection, routine and more complex scans. Administering other drugs, protocolling forms and checking orbit x-rays are activities over two thirds of the MRI technologists who responded are either currently performing or wanting to perform. Less than half of respondents either currently prescribe or want to prescribe contrast or other drugs and less than a quarter want to report routine scans.

Training and education provided for IV cannulation and contrast injection was more likely to be formally provided by an education provider or with formal in-house training. For MRI technologists who administer other drugs, prescribe contrast and other drugs, protocol forms and check orbit x-rays, learning is more likely to be by experience or informal in-house training. Education and training for performing routine and more complex scans is a mix of a post graduate qualification, formal and informal in-house training. Most MRI technologists felt their training and education was adequate for the activities they perform, however there are

a few who felt their training for contrast injection, drug administration and performing complex scans was inadequate.

When asked what type of training and/or qualification they think would be appropriate for the different role extension activities, formal training and education, either in-house or by an education provider, was suggested for the administration of other drugs, prescribing contrast and other drugs. In-house training is seen to be appropriate for protocolling forms and performing routine and more complex scans. A mix of in-house training and formal education was seen to be appropriate for reporting routine scans.

The results indicate MRI technologists are performing role extension activities and they are receiving formal training for some of these activities such as IV cannulation. However some felt their training was inadequate for some activities. Training given for role extension activities and the adequacy of it will be explored further in the discussion chapter following.

Chapter 5: Discussion

Introduction

This research dissertation reports on findings from a questionnaire sent out to 154 MRI technologists in New Zealand. The MRI technologists who responded to this survey reported they had a wide range of experience from those who were new into MRI to those who had over 20 of years' experience with the majority having over five years working in MRI. While the majority had a full scope of practice in MRI, technologists with a training scope were also represented. Respondents reported a variety of working environments with a mix of those working in private and public departments. The number of scanners and the staff working in the departments also varied with the size of departments ranging from two staff operating one scanner to 15 staff for four scanners. More respondents to this survey indicated they worked within the private sector than those who work in the public hospital sector (see Figure 6), which differs to the UK model where the research was based at NHS hospitals (Price et al.,2002; Price & Le Masurier, 2007). As more respondents indicated they work in the private sector it means that results may not be directly comparable as private facilities may function differently to public hospital departments in the types of examinations performed, the status of patients (e.g. acute non-ambulant patients versus non-urgent, walk-in, patients) and the support staff available (e.g. nurses and medical practitioners other than radiologists).

To gain further background information respondents were asked to indicate the types of scans performed in their workplace. The responses were separated into private and hospital categories to determine if there was any difference in the types of scans performed (see Figure 10). The frequency with which certain scans were performed in a private practice was compared to how often they were performed in a public hospital. The figures shown were very similar with the exception of breast MRI, which was more likely to be performed in a private department. While some activities, such as IV cannulation and contrast injection, were specific; other terms such as 'routine' and 'complex' were not defined. There may be local variations in whether or not a scan is routine or complex. What may be a routine scan in one department, may be referred to as complex in another because of a variety of reasons such as how often it is performed, and other factors such as the state of the patient (sedated, anaesthetised) administration of contrast, dynamic scanning.

Several themes emerged from the results which will be discussed. These include: role extension activities being performed officially and unofficially; supervision levels; the responsibilities of MRI technologists performing role extension activities; role extension and

advanced practice; the training and support received to allow MRI technologists to perform those roles; attitudes of MRI technologists about performing role extension activities; the opinion of MRTs regarding their educational support and needs; and work-based learning.

Role extension activities

Respondents were asked to comment on ten activities which were: IV cannulation, contrast injection, drug administration, prescribing contrast, prescribing other drugs, protocolling forms, performing routine scans, performing more complex scans, checking orbit x-rays and reporting routine scans (see Figure 11). These activities can be separated into two categories as described by Friedenberg (2000): procedural and cognitive, with some activities which could be either procedural or cognitive depending upon the situation in which they are performed.

Procedural tasks

Procedural tasks are activities where there are set guidelines and protocols to follow (Friedenberg, 2000). These include IV cannulation, contrast injection, drug administration and performing routine scans.

IV cannulation

The majority of MRI technologists who responded indicated they perform IV cannulation unsupervised with some supervised by a radiologist. There was no significant difference between private or public departments, however four respondents, who worked in a hospital environment, noted this activity was also performed by a nurse. Only two indicated this was a radiologist only activity, however they also indicated they perform IV cannulation. This may be because of different types of patients, for example radiologists may only insert an IV cannula in children or the technologist working may not have completed training or want to perform this task. Notably the rate of IV cannulation and contrast injection reported in this study is greater than that reported by Sinclair and Yielder (2007) which indicates an increased acceptance of these role extension tasks being performed by the MRI technologist. The adoption of IV cannulation by NZ MRI technologists follows a similar trend as that shown in the UK where there has been an increase in the number of departments that allow MRTs to perform IV cannulation. Price and Le Masurier (2007) reported there was a 40% increase in the number of radiographers performing IV cannulation from 2000 to 2004, with 95% of trusts allowing radiographers to cannulate. While this UK figure is dated and was not specific to MRI it still indicates the widespread adoption of IV cannulation as a MRT role.

Contrast injection and the administration of other drugs

The results show the number of respondents who are injecting contrast is similar to those performing IV cannulation. However, in contrast to IV cannulation, the reported level of radiologist supervision increased with over half of the respondents indicating they injected contrast while supervised. That leaves nearly half reporting they inject contrast unsupervised, with it occurring more often in a hospital environment than a private facility. Nurses were also reported to inject contrast in a hospital department. Only three respondents indicated contrast injection was a radiologist only activity. While contrast is administered mainly by technologists, the administration of other drugs is reported as being more likely to be supervised or performed by a radiologist. The reported unsupervised administration of other drugs is more likely to occur in a private department, whereas in public hospitals nurses are also reported to administer other drugs. Buscopan and hypnovel were given as examples of drugs, and the method of administration was not specified. The difference between the two drugs was noted by some respondents who stressed they only administer buscopan and not hypnovel. United Kingdom radiographers are able to administer IV contrast and also antispasmodics which is part of their training for barium enemas (Smith & Reeves, 2009). Price and Le Masurier (2007) indicated the number of UK radiographers performing IV injections increased over the period of their research and performing IV injections is now within their scope of practice.

Routine examinations

Almost all respondents reported MRI technologists perform routine scans mainly unsupervised with a few reporting supervision by a radiologist. Supervision by a radiologist may be occurring because the technologist is training and has not yet gained enough experience to scan unsupervised. Young (2008) reported in the early development years of MRI the radiologist would usually plan each scan. However, perfoming routine scans now appears to be firmly in the hands of the MRI technologist.

Cognitive tasks

Cognitive tasks according to Friedenberg (2000) not only involve image interpretation, but also require analysis and judgement skills that allow decisions to be made about differential diagnosis and referral for further investigations if necessary. Friedenberg adds that these decisions are more difficult than the decisions made for procedural tasks. Cognitive tasks include checking pre-MRI orbit x-rays and reporting routine scans.

Checking pre-MRI orbit x-rays

The checking of pre-MRI orbit x-rays for metallic foreign bodies was reported by respondents to be mainly the responsibility of the radiologist. However it was also reported MRI technologists are performing this activity either unsupervised or supervised by a radiologist. The availability of the radiologist appears to have some influence as to whether the technologist checks the images as one respondent from a public hospital stated they “will always try to get a radiologist to check films, but if a radiologist is not available the MRT will check.” An example of when a MRT will check the pre-MRI orbit x-ray is whenan urgent MRI examination is necessary after hours when a radiologist may not be available. It appears in some circumstances MRI technologists are unofficially performing this activity. In the UK radiographers have been interpreting and reporting images in the emergency department (Price & Le Masurier 2007) therefore this activity is probably well within the ability of a MRT. However there is a potential issue: who would be held liable if a patient entered the scan room and subsequently suffered an injury to their eye from a metallic intra-orbital foreign body that was missed by an MRT on a plain film not checked by a radiologist? This issue will be discussed later in this chapter.

Reporting routine scans

Respondents indicated this was a radiologist only activity which is in contrast to the UK where MRI radiographers are successfully reporting routine MRI scans (Smith & Reeves, 2009; Young, 2008; Young et al., 2010).

Tasks that could be procedural or cognitive

Tasks that could be procedural or cognitive include prescribing contrast and other drugs relevant to the procedure, protocolling forms and performing complex scans. Comments from respondents indicated contrast and buscopan were part of the protocol for certain examinations (e.g. contrast for patients who had previous spinal surgery within a specified time period; and buscopan for female pelvic scans) where in these cases the prescribing of contrast and other buscopan could be described as a procedural task. However, if a decision has to be made evaluating the benefit, or risk, and justification of prescribing contrast or drugs, this would become a cognitive task (Friedenberg, 2000). It is not clear from these results under which circumstances MRI technologists prescribe contrast. Likewise the protocolling of forms can be separated into two levels. One is deciding if the scan can be performed in an unsupervised (i.e. routine scan) or a supervised session (i.e. more complex scan); the other is deciding which sequences should be performed to best demonstrate any pathology seen. Performing more complex scans could also be a procedural or cognitive

task and may also depend upon the circumstances. The term ‘complex’ was not defined, therefore could range from any scan that was not routine, to those requiring contrast, and could differ between departments as a scan routinely performed in one department may only be performed occasionally in another.

Prescribing contrast and other drugs

Prescribing contrast was reported to be mainly performed by a radiologist only or under the supervision of a radiologist. There was no reported difference between public and private departments. Four respondents indicated contrast was prescribed unsupervised while another was unsure of the meaning of prescribing contrast and stated “we don’t prescribe as in charting, but decide whether we give it.” It appears MRI technologists may be unofficially performing this task. As for prescribing contrast, the prescription of other drugs was reported to be a mainly radiologist only activity or performed under the supervision of a radiologist. Seven respondents (all of whom work in a private department) indicated other drugs were prescribed unsupervised by MRI technologists. Again one respondent appeared to be unsure of what prescribing means and stated: “although we do not prescribe as such, we know all female pelvic scans require buscopan and will give it without the radiologist.” No respondent from a public hospital indicated drugs were prescribed unsupervised by the MRI technologist; however there were six respondents from private practices who indicated they prescribed drugs unsupervised. It appears this activity is being performed unofficially by some MRI technologists. In the UK radiographers do not have prescribing rights, but there is a push for radiographers to be given those rights (Francis & Hogg, 200; Hogg & Hogg, 2003). In contrast nurses in the UK and NZ do prescribe drugs within their speciality (Chaston & Seccombe, 2009).

Protocolling forms

Respondents indicate the protocolling of forms is mainly performed unsupervised by MRI technologists, however some respondents also indicated there were two separate levels of protocolling forms: routine and non-routine. Some reported only routine scans were protocolled unsupervised, whereas non-routine were protocolled by the radiologist or under supervision from the radiologist. It appears MRI technologists are unofficially performing this activity with one respondent stating “we don’t ‘officially’ protocol forms but do decide whether or not a patient is scheduled for a supervised session …” while another stated “when no doctors available on a night shift/weekend we scan unprotocolled forms and also guide junior registrars with protocol.” According to Young (2008), determining whether a scan should be in a routine or supervised session involves authorisation, not protocolling, and suggests there is a difference between the two activities. The authorisation of forms was not

given as an option in this survey, however the comments given indicate that respondents take protocolling to include authorisation tasks such as described by Young (2008) which may include:

- Determining the appropriateness of the examination for the clinical indications
- Classifying the scan such as 'routine'or 'radiologist supervision required'
- Prioritising scans according to their urgency
- Determining a protocol for the scan

Complex examinations

While it was reported MRI technologists mainly perform complex scans, 57% of respondents indicated they were doing this without supervision from a radiologist. The seniority and experience of the technologist, the type of examination, and the patient condition may have an influence on the supervision levels provided. Young (2008) reported in 2007 there was a large number of technologists who were performing routine scans unsupervised and a natural extension would be for technologists to perform more complex scans without supervision by a radiologist. The results from this survey suggest this is happening.

Supervision and practice criteria

The level of radiologist supervision varied for each activity investigated in this survey. The term 'radiologist supervision' was defined as 'radiologist on site', which was open to interpretation, therefore the true level of supervision is unknown. The least amount of supervision by radiologists was reported for the more technical or procedural tasks such as performing routine scans and IV cannulation. The tasks which MRI technologists performed under radiologist supervision appear to be those which may be perceived to be of higher risk to the patient (such as the administration of contrast and other drugs) or where decisions may need to be made justifying the prescription of contrast or performing complex scans. Supervision levels were reported to be similar in public and private departments.

While some activities are officially 'supervised' it appears from the results some MRI technologists in some departments are also unofficially performing some of the role extension activities unsupervised, in particular prescribing contrast and other drugs, and checking orbit x-rays. One respondent stated "in 99% of cases the MRT knows when contrast is required but just needs the radiologists' approval." Wilson and Bunnell (2007) reported that prior to nurses gaining prescribing rights they were prescribing informally for years, where the nurse would write a prescription for a patient then take it to a doctor who would then sign it. Maybe the next logical step is for MRI technologists to gain prescribing

rights for certain contrast agents and medications relevant to MRI. In the last five years legislation allowing supplementary prescribing by UK radiographers subject to Parlimentary approval came into effect (Hogg & Hogg, 2003) recognising the appropriate prescription of contrast and some drugs is well within the ability of the radiographer.

The limited and ad hoc way in which some of these role extension activities are performed could create barriers for further role development. Kelly et al.(2008) suggest that while local service may be improved, failure to develop well defined practice criteria may lead to MRI technologists being unable to transfer skills learned in one workplace to another unless criteria for role extension activities are standardised and accredited.

The extent of role extension activities by MRI technologists

The rate of adoption of role extension activities appears to be linked to the type of activity as described by Friedenberg (2000). Those activities described as procedural are being performed more often than those described as cognitive. When asked which tasks they are currently performing 90% or more respondents indicated they perform IV cannulation, contrast injection and both routine and complex scans (see Figure 12). Seventy five percent of respondents reported they protocol forms, while 42% of them administer other drugs. Those activities such as prescribing contrast and other drugs, which can be described as procedural or cognitive, depending upon the environment in which they are performed, rated at 13% and 15% respectively, of respondents performing them.

However at what stage do these tasks become part of normal practice? Hardy and Snaith (2006) suggest there is no clear point at which this occurs. According to Woodford (2006) the occurrence of role extension activities being practiced can be separated into three categories. Those categories are ‘widespread’, ‘well established’ and ‘other roles’. Activites are described as being ‘widespread’ when they are considered to be part of routine practice, those that are ‘well established’ are performed frequently but are not part of routine practice and ‘other roles’ which have developed in response to local needs. MRI technologists are performing routine scans as a basic component of their role, therefore this practice is widespread. Intravenous cannulation is an extended role performed by over ninety percent of respondents making this a well established practice, one which the skill and knowledge to required to perform this task are acquired separately to the postgraduate MRI qualification. While this research dissertation has been focussed on MRI another area for further research would be to investigate role extension activities such as these, but performed by MRTs in other areas for example CT and angiography.

MRI technologists' responsibilities

It appears from the results that MRI technologists are unofficially prescribing contrast and other drugs and checking orbit x-rays. If a patient has an allergic reaction does the MRI technologist, who 'unofficially' prescribed the contrast while unsupervised, have the knowledge, skill and authority to deal with and administer any further medications? Who is responsible if a patient suffers damage to their eye from an intra-occular metallic foreign body that was missed by the unsupervised MRI technologist who 'unofficially' checked the images? If cases of negligence are brought against the MRI technologist in cases as described, where do they stand legally? Medical practitioners , while not fully relinquishing their responsibilities, are able to delegate clinical tasks to non-medical staff as long as the staff are competent to undertake those tasks (White & McKay, 2002). However good defence of charges of negligence requires that the action of the defendant must be shown to be rational, justified and supported by guidelines or protocols based on evidence from medical research (Alderson & Hogg, 2003; Buttress & Marangon, 2008; Smith, 2008). Alderson and Hogg (2003) suggest that a technologist would not be expected to have skills equal to that of a radiologist however the technologist should be able to recognise the limits of their expertise and know when to refer to a radiologist. Recognition of these limitations should be included in department protocols. It is the responsibiltyof the technologist, according to Keenan et al.(2001), to ensure policies are in place outlining details of the delegated task and how it is to be performed to minimise potential risks to patients and staff. Also the existence of a policy document outlining an agreement between the technologist and the department manager would show the employer accepts vicarious liability for named individuals who undertake role extension activities as described in the protocols.Therefore MRI technologists who are prescribing contrast and other drugs, and checking orbit x-rays need written guidelines (Keenan et al., 2001) and should be aware of the limits of their ability and when to refer to a radiologist (Donovan & Manning, 2006).

Role extension or advanced practice?

Results show MRI technologists are performing role extension activities but, by virtue of their post-graduate qualification, are they eligible to be advanced practitioners? Hardy and Snaith (2006) describe role extension as when the MRI technologist acquires responsibilities, skills and duties which are more than is expected for a newly qualified technologist. MRI technologists are expected to perform routine scans and possibly more complex scans. Tasks such as IV cannulation along with contrast and other drug administration, are other skills acquired separate to the MRI qualification, therefore these would be role extension activities. However role extension is NOT advanced practice. There are fundamental

differences between role extension and advanced practice. If MRI technologists were trained to read and report routine scans, that in itself is not advanced practice unless they have a clinical leadership role and are actively involved in research, evidence based practice, teaching and supervision (Hardy & Snaith, 2006; Nightingale & Hogg, 2003). Hardy and Snaith (2006) suggest that not all MRI technologists who perform role extension would be eligible for (or want) the role of advanced practitioner. Usually there would be one advanced practitioner in a department, maybe with others performing extended roles.

What do MRI technologists want to do?

The results of Question 13 (see Figure 12) showed that over 90% of MRI technologists who responded were currently performing procedural tasks such as IV cannulation, contrast injection and performing scans (routine and complex). These results also supports other data showing MRI technologists are performing role extension activities including: prescribing contrast and drugs; and checking orbit x-rays. The activities respondents were most willing to take on were in order from the most desired activity: administering other drugs; checking orbit x-rays; prescribing contrast; prescribing other drugs; and reporting routine scans. The least desired activities would require cognitive skills such as decision making and justification. While there were some respondents who would like to perform further role extension activities including reporting routine scans, there are others who were opposed to any idea of MRI technologists extending their role with comments such as: “Don't think we should do as don't have the broad medical knowledge like Radiologists. Would need major training” for prescribing contrast and other drugs; “Radiologists responsibility. Need to have Radiologists with overall responsibility for this” for checking orbit x-rays; and “not interested in reporting MRI scans I feel this is the Radiologists role.”

There were some respondents who indicated interest in role extension but put barriers in the way with comments such as: “I would like to report on certain scans, but need more training still have to be 'doubled' by Radiologist so would help take stress off them. Too busy scanning anyway!” While some technologists desire role extension and advancement generally there needs to be a change in attitude before there is a more positive move towards advanced practice. However this change in attitude may be a challenge for some MRI technologists as Yielder and Davis (2009) suggest certain personality types, who fear change and new approaches, are attracted to medical imaging. When they are put into the medical imaging environment (which is focussed on technical detail and the immediate effects of medical imaging) they may resist change and the opportunity to advance professionally. This may also be compounded by the traditional hierarchy of medical imaging where radiologists hold the knowledge and use it to control MRTs by way of imposing

restrictions on them by the supervision of, and restricting or excluding MRTs from performing certain activities (Yielder, 2006; Yielder & Davis, 2009). The historical subserviant attitude of MRTs appeared with the comment from one respondent when indicating if they would like to report routine MRI scans: they wrote “would do this with some training, but radiologists will not permit this.” Results from this survey show that not all respondents want to perform role extension activities nor should they be expected to, however if a technologist expresses the desire and the personal skills, to extend their role, or even progress to an advanced practitioner status, then the opportunity should be available just as some MRTs choose to train further in another modality such as MRI or ultrasound and some do not.

Training and education

Training provided for the role extension activities in this survey varied and included: experiential learning; in-house training, both formal and informal; formal education by an outside provider; and post graduate qualification. Hardy and Snaith (2006) suggest formal education and qualifications are not always necessary for role extension. This is reflected in the results of this survey regarding the level of training given for each task. The MRI technologists performing tasks which are more specific to MRI, such as protocolling forms and performing routine and more complex scans, were more likely to have learned these tasks via experience and/or in-house training, either formal or informal (see Figure 13). Education and training provided for those tasks which were traditionally performed by another health professional, such as IV cannulation, which were more likely to be formally offered by an education provider or in-house. However results suggest there is more formal training for procedural activities such as IV cannulation when compared to the training received for more cognitive tasks such as prescribing contrast and other drugs. Comments made by some respondents indicated that some MRI technologists may be completing courses for IV cannulation which are in place for other health professionals (e.g. nurses). One respondent commented that “training was more related to nursing and fluid therapy’ and another said if they were to do an IV cannulation course it would be the “inhouse District Health Board training our nurses do.”

Adequacy of training

While most respondents indicated the training they had received for each role was adequate, there were some who felt their training was inadequate. The role extension activities for which more than one respondent felt training was inadequate were: contrast injection; administration of other drugs; and performing more complex scans. For IV cannulation and contrast injection one respondent noted: “current in-house training is very long-winded and related to nursing fluid therapy.” Another stated their training for performing more complex

scans was unsatisfactory as “this seemed to rely on observation only. During my early training period there was a lack of structure to my training needs. I felt let down.” However not all comments showed dissatisfaction as one respondent stated “I am happy with the training I receive in my department for all the roles I perform.”

It appears the reasons that respondents felt their training for specific role extension activites was inadequate included: the training course was designed for another group of health professionals and not specifically for MRI technologists; a lack of structure to in-house training; and not adapting the training style to meet the individual needs of the trainee.

The type of training MRI technologists want

There was much more feedback from respondents about the type of training and education they would suggest for the different role extension activities than there was for any other question in this survey. There were a wide range of opinions from respondents with themes emerging for similar activities therefore they will be grouped together for this discussion.

IV cannulation, contrast injection and administraion of other drugs

Respondents indicated in-house training was available for IV cannulation and the administration of medicines, however the number of MRI technologists in a hospital is quite low when compared to the number of nurses, therefore it may be unlikely for in-house courses to be geared towards MRI technologists. There are two distinct requirements needed to enable technologists to fully engage in the administration of contrast and other drugs. One is a practical component which entails the insertion of an IV cannula and the actual administration of contrast and other drugs. The other is an educational requirement where knowledge is acquired to support the practical aspects of the administration of contrast and other drugs.Some of the topics respondents suggested to be included in educational requirements are: how to recognise and treat allergic reactions/anaphylaxis; NSF; the effect and implications of reduced renal function in patients; risk assessment; more background information and contraindications for other drugs such as buscopan and sedation. The educational aspects could feasibly be provided by an education provider with the curriculum specifically geared to meet the needs of MRI technologists.

Prescribing contrast and other drugs

The need for formal training for prescribing contrast and other drugs was recognised by respondents with a greater number of responses implying the need for education from an education provider with certification or a post graduate qualification than for less formal training. While many suggested topics to be covered were similar to those suggested for the

administration of contrast and other drugs one respondent suggested a course to include "pharmacology and prescribing."

Prescribing medications is a step further on from administering those medications. Francis and Hogg (2006) suggest there are three components to training and education to enable therapy radiographers to gain clinical competency for prescribing medications to gain clinical competence. These are prescribing behaviour (which is seen as separate to the specific clinical setting for radiographer prescribing), relevant knowledge of medications and their use and working with a medical mentor to facilitate further development of the trainee prescriber. The three components are equally relevant to MRI technologists who wish to prescribe. Relevant knowledge of the medicines and their use may be adequately covered by education for the administration of contrast and other drugs, whereas the areas of prescribing behaviour and having a medical mentor places the training for prescribing a step further on than the administration of drugs. It may be argued that a MRI technologist would not need this level of training in order to prescribe contrast and buscopan, as it is a very limited scope. However MRI technologists are a part of a larger professional group and some other sections of the profession, for example radiation technologists, may require prescribing rights in order to manage treatment side effects (Francis & Hogg, 2006) therefore education standards to meet the needs of the whole group should be considered.

Protocolling forms, performing routine and more complex scans

Results from the research (see Figure 11) show protocolling forms, performing routine and complex scans were predominantly performed by the MRI technologist with or without supervision from a radiologist. This esoteric knowledge is best passed on to trainees by MRI technologists themselves and this is reflected in the respondents' comments with in-house training being the most commonly suggested form of training. It can be inferred from comments made by two respondents that they recognise there are differences in the knowledge required for different departments as they would like to see a "sharing of knowledge" either by "spending time in another department" or "formal user meetings."

Respondents suggest the skills required to protocol forms comes with experience and support from the radiologist. For performing routine scans respondents gave few comments however one respondent noted the differences in training when comparing different sites by stating that in one hospital, training was "based on a six week programme (in-house). At current workplace the training takes as long as it takes with no real pressure." In-house training involves learning in a work-based environment. Eddy (2010) suggests that in order

for departments to support students, careful consideration needs to be given to how support can be introduced and provided for individual students.

Checking pre-MRI orbit x-rays

Over a third of respondents acknowledged a need for MRI technologists to receive training for checking pre-MRI orbit x-rays, however there was a range of opinions as to the type of training required. One respondent stated that “after years of general radiography prior to specialising in MRI, I think this task is well within the scope of any MRI technologist” suggesting experience alone is sufficient training. However, an unpublished study (cited in Bailey & Robinson, 2007) compared the rate of identification on digital images of seven metallic fragments, of varying sizes, in a Perspex skull phantom by several observers. While it was not stated who the observers were or what training they had received, some observers identified more foreign bodies than others although no one identified all the foreign bodies. It was however noted that not all the foreign bodies would be visible on images. So while training would not help observers to identify foreign bodies not visible on the images, it could increase the detection rate of those objects which are visible on the images. Some respondents suggested they would be able to check pre-MRI orbits x-rays without further training, however as this unpublished study suggests identifying intraocular foreign bodies may not be as straight forward as it seems. Therefore some form of training is likely to be necessary even for a MRT who has had many years of experience in general radiography. Accordingly, the majority of respondents did support some type of formal training either: in-house training with support from a radiologist, or training provided by an education provider in the form of a short course or possibly a certificate.

Reporting routine scans

The majority of respondents who made comments about training requirements for reporting routine scans suggested formal postgraduate education by an education provider, with some identifying a need for in-house training with radiologist support. Formal postgraduate education is in line with the requirements for education and training suggested by Paterson et al. (2004), where reporting radiographers should not only complete an accredited postgraduate reporting course, but also be allowed time, and given support for in-house training.

Work-based training

The results also showed training and educational requirements vary according to the nature of the role extension activity. Individual respondents also differed in their opinion as to the educational and training requirements for each activity. While formal courses and

postgraduate qualifications are needed for some role extension activities according to some respondents, it appears there is one form of training that is recommended for all the activities discussed here. That is in-house or work-based training.

According to Ferrara (2010) students are mainly taught to a set protocol which they may assume to be best practice, however work-based training, allows for the student to be able to play an active role in their own learning. A preceptor, rather than a teacher, creates a scenario where the student learns by doing. Students gain new meaningful information through a process of receiving new information, making sense of it and incorporating it into their thinking and behaviour. Once students have learned and assimilated their new knowledge they need a period of time in which to gain confidence in their new role (Snaith & Hardy, 2007). To support role extension for MRI technologists, departments and education providers need to work together to provide a work environment that allows work-based learning to occur (Eddy, 2010). However there can be many barriers to overcome before work-based learning is successful. These can include: a shortage of staff to allow time for learning; lack of support from peers and colleagues; competition from other health professionals for those roles (e.g. from radiology nurses for prescribing and administering other drugs); lack of consistency from radiologists (e.g. different radiologists may have different opinions as to whether contrast is required for a particular situations); and lack of suitable staff to act as mentors and preceptors (Eddy, 2010). With proper support from departments, radiologists, professional bodies, education providers and most importantly MRI technologists themselves, it would be possible to establish effective work-based learning opportunities to allow MRI technologists to formally extend the role which they perform.

Guidelines and recognition

In other countries role extension has occurred haphazardly with varying levels of education and training. National guidelines, such as those introduced in the UK, provide guidance for particular scenarios (Nightingale, 2008). In the UK the College of Radiographers issues a certificate of competence to radiographers for the administration of intravenous injections (Keenan et al., 2001). Recognition by a professional body of completion of an approved training course would provide reassurance to patients, employers and MRTs themselves, that a high level of competency is attained and would allow transferability of skills. However Woodford (2006) suggests it is not necessary to have national certification as long as each MRT is familiar with, and complies with, the local protocols set by their employer. Protocols set down standards of best practice for specific procedures or scenarios (Nightingale, 2008) and it is the MRTs responsibility to be familiar with these protocols, to work within the rules

set down, to know their limitations and to be aware of their responsibilities when performing role extension activities.

Summary

The respondents surveyed for this dissertation represented a cross section of MRI technologists practicing in NZ. They came from a variety of work places, small and large departments with staff numbers ranging from one to over ten and scanners worked on from one to four, private and public hospitals, private practices, MRI only practices, and university research facilities. There appears to very little difference in the examinations performed at a public hospital when compared to private practice. Many MRI technologists are performing role extension activities with procedural tasks, such as IV cannulation and the administration of contrast and other drugs, being more common than those requiring cognitive skills. In some departments MRI technologists have competition from other health practitioners (i.e. nurses) for these roles. Performing routine and complex scans and authorising forms are what the MRI technologist does and defines their role. Roles such as prescribing contrast and others drugs along with checking pre-MRI orbit x-rays and reporting routine scans are still seen as belonging to the radiologist, however a few technologists indicated they unofficially prescribe contrast and other drugs and check orbit x-rays.

It is the MRI technologists' responsibility to ensure guidelines and protocols are in place for safe and evidence based-practice, and a policy exists outlining an agreement between the department manager and the MRI technologist regarding role extension activities. Role extension does not equate to advanced practice. There was little difference in radiologists supervising MRI technologists in public departments compared to private departments. Of the role extension activities discussed, the least amount of supervision was given to procedural activities such as performing routine scans, IV cannulation and protocolling forms where it was more likely for the MRI technologist to perform this task unsupervised than supervised. There was more supervision provided for complex scans however respondents reported it was more likely complex scans were performed without radiologist supervision. Radiologist supervision was more often than not provided for contrast injection, drug administration, prescribing contrast and other drugs and checking orbit x-rays.

Some respondents would like to perform role extension activities they do not currently perform while others would not, with varying levels of interest with over half the respondents expressing the opinion that reporting routine scans, prescribing contrast and other drugs is the responsibility of the radiologist. Education and training was varied for each of the activities, with in-house training provided for most activities although of note there was no

formal training provided for activities respondents reported they ‘unofficially’ perform (i.e. checking orbit x-rays, prescribing contrast and other drugs). Despite this the majority of respondents felt their training was satisfactory. Training and education for MRI role extension activities needs to be geared for the MRI technologist. Using similar courses provided for other health professionals does not necessarily provide the right training. According to respondents, different role extension activities require different levels of education however support and in-house training were seen as essential for all the activities discussed.

Chapter 6: Conclusions

This dissertation proposed to investigate the current status of role extension for MRI technologists. Objectives of this research were to identify role extension activities performed by MRI technologists, to differentiate between routine activities and those seen as role extension and to determine how widespread those activities are. The education and training received by the technologists to enable them to perform the role extension activity was also investigated along with identifying any areas where formal education requirements may be needed. While this was achieved, other areas of support were also identified as being crucial for formal role extension activities to be a part of the MRI technologists' role. This research only investigated role extension for MRI technologists, however the areas of support identified could equally apply to other disciplines and modalities within medical imaging such as CT, angiography, emergency department radiography and nuclear medicine. Further research in these areas (especially for those for which a formal post-registration qualification is not a pre-requisite), may be helpful in identifying further areas of role extension within medical imaging.

This research has shown that MRI technologists in NZ work either in a public hospital or a private practice environment, with little difference between the role extension activities they perform. Some of the activities investigated, such as performing routine and complex scans, and authorising forms, are integral to the role of the MRI technologist. Other roles such as IV cannulation and the administration of contrast and other drugs are common procedural role extension activities performed by MRI technologists. Some MRI technologists indicated they are prescribing contrast and other drugs, and checking pre-MRI orbit x-rays. These activities require assessment and judgment calls; therefore tend to require more cognitive skills.

Most technologists surveyed were satisfied with the training they were given to allow them to perform activities, however results revealed, there was more training and education given for procedural type tasks than for those requiring greater assessment and judgment skills. Some of the training courses available for IV cannulation were already in place for other health practitioners, such as nurses, and did not meet the needs of MRTs. This may indicate a lack of leadership and foresight from the medical imaging fraternity which may be a result of the traditional subservient attitude of 'tell us what to do' (Yielder & Davis, 2009).

This research shows that multi-level support and collaboration from a variety of sources is critical to the evolution of role extension for MRI technologists and other MRTs. Support is required at a higher level from educational providers, department managers, professional

bodies and the government. Within each department support is also required from radiologists, MRTs and other staff. Research has shown that work-based training in collaboration with education providers, along with local support, may be the best way to develop role extension (Kelly, Piper & Nightingale, 2008; Snaith & Hardy, 2007). Education providers and department managers need to work together with the professional body guiding them so the education needs of MRTs are met. Education will need to step out of the lecture rooms and into the workplace. If this is not done there is a risk of under-trained and under-skilled MRTs performing roles that they are not fully competent in performing. This may not only be detrimental to the patient but also to the MRT, the department and medical imaging community as whole.

A lack of consistent standards, both within departments and nationally, may be a barrier to the successful implementation of role extension (Snaith & Hardy, 2007). National guidelines from relevant professional bodies are needed to ensure education and training for role extension develops in a consistent and coherent way across the country (Smith & Lewis, 20020. If this is not achieved the proposed role extension and advanced practitioner pathway are unlikely to evolve and MRTs may forever remain the handmaidens of medical practitioners and other health practitioners.

A limitation of this research is that only MRI technologists were surveyed. It is not known if MRTs working in other modalities are encountering the same issues regarding education and training they receive for role extension activities. New Zealand MRTs who work in specific areas (for example emergency radiography, CT and angiography) may also be unofficially performing role extension activities for which they may not have received adequate training. Further research could investigate role extension activities in modalities other than MRI.

The following are suggested recommendations outlining the support required to enable MRTs to extend their roles, and advance their profession. It is recommended that education and training appropriate for MRTs performing role extension activities needs to include:

1. Collaboration between department managers and education providers to develop work-based training programmes.
2. Support from the NZIMRT by way of providing national guidelines for the level of education and training required for role extension activities, to ensure consistency of training standards.
3. The NZIMRT providing guidelines for safe practice and to allow New Zealand MRTs performing role extension activities to be aware of their responsibilities.

4. Support at a departmental level from the medical profession, management, other health professionals and allied staff to allow MRTs time and resources for work-based role extension training and education.

In conclusion this research has found that some MRI technologists in New Zealand are performing role extension activities both ‘officially’ and ‘unofficially’ with varying degrees of training. Role extension is a step towards advanced practice. Some may think they are already advanced practitioners because they have a postgraduate qualification and perform role extension activities; however advanced practice is much more than that. MRI technologists would also need to embrace leadership roles, research, possess the necessary personal skills, and have the right educational and departmental support before becoming the first advanced practitioners for MRI in NZ. This role may only be for a few who are willing to step outside the comfortable world of medical imaging and challenge boundaries. New Zealand MRTs are very small in number when compared to the number of radiographers in the UK. Therefore to have a stronger voice and to develop training that is relevant to MRTs it is important that professional bodies, education providers and leaders within the profession work together to build a robust base on which role extension can build and expand to support advanced practice. Most importantly MRTs need to critically reflect on the training and education they are given and to become proactive in the development of their own training and education in order to lead the way to a future where advanced practice is a reality.

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MRI Work Practice Questionnaire Part One: About you and your workplace

Please answer by ticking the box or writing in your answer.

1. Are you: □ Female □ Male

2. Age: □ 20-29 □ 30-39 □ 40-49 □ 50+

3. What type of scope of practice do you hold in MRI?

   □ Training MRI □ Full scope MRI

4. With which education provider are you or were you enrolled to complete your postgraduate qualification?

   □ University of Sydney □ Unitec □ Not Applicable i.e. CBA or REA □ Other (please state): _____

5. How long have you been practicing MRI?

   □ Less than 2 years □ 2 years to 5 years □ Longer than 5 years

6. How would you best describe your workplace?

   □ Based at a Public Hospital □ Based in a private practice that offers other imaging modalities.
   □ Based at a Private Hospital □ Private practice that only offers MRI

7. How many MRI technologists work in your department with a full SOP?_____

8. How many MRI technologists work in your department with a training SOP?_____

9. How many MRI technologists routinely work at any one time in your MRI department?

   □ 1 □ 2 □ 3 or more

10. What is your job title?

    _____

MRI Work Practice Questionnaire Part Two: Your work activities

11. Please indicate by how often the following scans are performed in your department by circling the answer.

Activity	**How often performed***		
Neuro imaging	**Routinely**	**Occasionally**	**Never**
Spine	**Routinely**	**Occasionally**	**Never**
Musculoskeletal	**Routinely**	**Occasionally**	**Never**
Abdominal/Pelvic	**Routinely**	**Occasionally**	**Never**
Contrast Enhanced MR Angiography	**Routinely**	**Occasionally**	**Never**
Breast	**Routinely**	**Occasionally**	**Never**
Cardiac	**Routinely**	**Occasionally**	**Never**
Spectroscopy	**Routinely**	**Occasionally**	**Never**
Functional	**Routinely**	**Occasionally**	**Never**
Paediatric patients	**Routinely**	**Occasionally**	**Never**
Anaesthetised patients	**Routinely**	**Occasionally**	**Never**
Research	**Routinely**	**Occasionally**	**Never**
MRI guided biopsy	**Routinely**	**Occasionally**	**Never**

*Routinely: more than once a month on average over the last year
Occasionally: less than once a month on average over the last year
Never: not performed

12. Please indicate, by placing a tick in the boxes, the advanced roles that are performed in your department and by whom.

Activity	By MRI MRT, unsupervised	By MRI MRT supervised by senior MRI MRT	*By MRI MRT supervised by radiologist	By radiologist only
IV cannulation				
Contrast injection				
Administration of other drugs relevant to procedure (i.e. Buscopan, Hypnovel)				
Prescribing contrast				
Prescribing other drugs relevant to procedure (i.e. Buscopan, Hypnovel)				
Protocolling forms				
Performing routine scans				
Performing more complex scans				
Checking plain x-rays for metallic intraocular foreign bodies				
Reporting routine MRI scans				

*Supervised by a radiologist on site

13. Please indicate by ticking the boxes below which activities listed below you currently perform, those you would like to perform and those you do not want to perform.

Activity	Currently perform	Do not perform but would like to perform	Do not perform and do not want to perform
IV cannulation			
Contrast injection			
Administration of other drugs relevant to procedure (i.e. Buscopan, Hypnovel)			
Prescribing contrast			
Prescribing other drugs relevant to procedure (i.e. Buscopan, Hypnovel)			
Protocolling forms			
Performing routine scans			
Performing more complex scans			
Checking plain x-rays for metallic intraocular foreign bodies			
Reporting routine MRI scans			

MRI Work Practice Questionnaire Part Three: Your training and education

14. What training and/or education were you given for each role extension activity you perform?

Activity	Not applicable	None, learnt by experience	*Informal in-house training	**Formal training – in-house	Formal training by education provider	Formal Post graduate paper
IV cannulation						
Contrast injection						
Administration of other drugs relevant to procedure (i.e. Buscopan, Hypnovel)						
Prescribing contrast						
Prescribing other drugs relevant to procedure (i.e. Buscopan, Hypnovel)						
Protocolling forms						
Performing routine scans						
Performing more complex scans						
Checking plain x-rays for metallic intraocular foreign bodies						
Reporting routine MRI scans						

*Informal in-house: taught by colleagues no set training plan

**Formal in-house: taught by colleagues, set training plan

15. Please tick the box to indicate if you felt the training and/or education was adequate or not. If you answer inadequate to any activity please explain why it was and what you would like to see happen to improve the training in the space provided. If you need more room please write on the back of the page.

Contrast injection: □ adequate □ inadequate □ not applicable

Administration of other drugs relevant to procedure (i.e. Buscopan, Hypnovel): □ adequate □ inadequate □ not applicable

Prescribing contrast: □ adequate □ inadequate □ not applicable

Prescribing other drugs relevant to procedure (i.e. Buscopan, Hypnovel): □ adequate □ inadequate □ not applicable

Protocolling forms: □ adequate □ inadequate □ not applicable

Performing routine scans: □ adequate □ inadequate □ not applicable

Performing more complex scans: □ adequate □ inadequate □ not applicable

Checking plain x-rays for metallic intraocular foreign bodies: □ adequate □ inadequate □ not applicable

Reporting routine MRI scans: □ adequate □ inadequate □ not applicable

16. Of those roles you currently do not perform, but would like to perform, what type of training and/or qualification would you like to be available:

IV cannulation:

Contrast injection:

Administration of other drugs relevant to procedure (i.e. Buscopan, Hypnovel):

Prescribing contrast:

Prescribing other drugs relevant to procedure (i.e. Buscopan, Hypnovel):

Protocolling forms:

Performing routine scans:

Performing more complex scans:

Checking plain x-rays for metallic intraocular foreign bodies:

Reporting routine MRI scans:

Thank you for completing this survey. Please place the completed survey into the return self-addressed envelope and post it by 11 June 2010.

10 May 2010

Dear MRI Technologist,

You are invited to take part in this survey ***to investigate the current state of role development and educational needs for MRI technologists in New Zealand performing role extension activities*****.**

My name is Delia Dephoff and I am an MRI technologist working in private practice in New Zealand. I am currently enrolled as a student in the Master of Health Science programme at Unitec. I am undertaking this research dissertation to complete this course.

The objectives of this research are to

1. Identify role extension activities performed by MRI technologists and to differentiate between activities seen to be routine and those that are identified as role extension.
2. Determine how widespread the role extension activities are that are currently being performed by MRI technologists in New Zealand.
3. Investigate the education and training (formal and informal) given to the MRI technologists to enable them to perform these role extension activities and to identify areas where formal education requirements maybe needed.

Why this research?

The role of the MRI technologist in New Zealand is still developing as more MRI scanners are installed and more MRTs are training in MRI. MRTs who take on this role are performing role extension activities such as intravenous cannulation and contrast injection. By completing this survey you will help to provide important information about which activities are becoming entrenched into the role of the MRI technologist. This information may help to guide future development and educational support for MRI technologists.

About the survey

This survey is designed to gather information about roles and activities you currently perform as an MRI technologist and the training and/or education you have been given in order to perform them. You will not be asked to identify yourself and the answering of this questionnaire is voluntary. Consent is implied by the completion of the questionnaire. All information will remain completely confidential. The return envelopes will be coded to track the numbers returned from different regions in New Zealand and will be separated from the questionnaires on receipt by an independent third party.

The first section covers back ground information, the second investigates the actual roles you perform and the last section will ask about the training, if any you have

received and if you feel this was adequate. Please attempt every question and if you wish to add any extra comments please do so.

The results of this dissertation will be available at the end of 2010. If you would like a summary of those results to be sent to you, please feel free to contact me.

If you have any questions about this questionnaire, you may either contact me ddephoff@gmail.com or my supervisor, Dr Jill Yielder, Department of Medical Imaging, Unitec (jyielder@unitec.ac.nz).

Once you have completed this survey, please place it in the stamped, self addressed envelope supplied and post it by 11 June 2010.

Thank you for your time and input in completing and returning this questionnaire.

Kind regards
Delia Dephoff

UREC REGISTRATION NUMBER: 2009-1022
This study has been approved by the UNITEC Research Ethics Committee. If you have any complaints or reservations about the ethical conduct of this research, you may contact the Committee through the UREC Secretary (ph: 09 815-4321 ext 6162). Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.