

**Australian rural radiographers:
radiographic interpretation,
communication and disclosure of
their radiographic opinion**

Kathryn Squibb

**DipDiagRad, GradDipUltrasonography,
MAppSc (MedUltrasound)**

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Declaration of Originality

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Abstract

Rural radiographers draw upon informally, experientially acquired knowledge in order to navigate dilemmas and activities that demonstrate complex ethical and social dimensions in their practice. Through an exploration of the social and historical world of the rural radiographer, this thesis generates a substantive theoretical insight into rural radiographers' participation in radiographic interpretation, communication with referrers and disclosure of their radiographic opinion to patients, with a specific focus on plain film radiography.

A two phase, exploratory interpretive study was undertaken. The first phase employed a paper based questionnaire and elicited information from Australian rural radiographers that included demographic profile, context and patterns of service delivery. The purpose of the questionnaire was not to draw statistical conclusions about the rural radiographic population, but rather to gather a demographic snapshot of rural radiographers and to determine radiographers' involvement in radiographic interpretation, communication and disclosure of their radiographic opinion. To this end the quantitative component of the questionnaire data was analysed using frequency analysis. Consistent with field literature, the questionnaire data demonstrated that radiographers are engaged in radiographic interpretation, communication with referrers and disclosure of their radiographic opinion to their patients.

Emerging findings from the questionnaire provided the foundation for the second stage of the study, interviews with radiographers again providing radiographic services in rural Australia. The thematic analysis of the interview data revealed that, without a clear picture of where they stand medico-legally, rural radiographers draw on an experiential collective of radiographic perception and radiographic interpretation skills as the basis for the complex decisions they make about communication and disclosure of their radiographic opinion. Furthermore, the findings show that the level and method of disclosure chosen by radiographers is governed by the diagnostic, therapeutic and emotional impact this disclosure may have on the patient.

Rural radiography transcends the technical image that dominates the field literature and extends to a more humanistic endeavour: patient welfare is central to the

practice world of the rural radiographer. Utilising a social constructionist framework, theoretical explanations of radiographic practices in relation to radiographic interpretation, communication and disclosure were generated. This study shows that rural radiographers' construct of their role in patient care extends beyond image acquisition into radiographic image reading, communication and disclosure of their radiographic opinion.

A key finding from this study is that rural radiographers, guided by an ethic of care, navigate a complex interplay of variables as they decide the way in which to convey their radiographic opinion. Radiographers' communication of their radiographic opinion with referrers is mediated by the radiographer/referrer game and tends to diagnostic accuracy, but with patients, disclosure is diagnostically vague and may be understood as filtered truth. The way in which rural radiographers convey their radiographic opinion is contextual and informed by experiential knowledge that has evolved through their shared experience of clinical practice in rural settings. This knowledge contributes as equally to an effective outcome for the patient to a radiographic examination as the radiographer's technical expertise in image acquisition; it is however not well described in the radiographic literature nor does it seem to be commonly discussed amongst radiographers and their health care colleagues.

The findings from this study indicate that a mismatch in educational preparation, compounded by a lack of professional guidelines and legislative clarity, has led to the ways in which radiographers choose to convey their radiographic opinion. It is important that this implicit and tacit dimension to rural radiographic practice is understood so that it can inform professional, educational and policy decisions relating to radiographers' contemporary scope of practice.

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Contents

Declaration of Originality	ii
Statement of Authority of Access.....	iii
Abstract	iv
Acknowledgements	vi
Contents	vii
List of Figures	xii
List of Tables.....	xii
Abbreviations and Acronyms	xiii
Publications arising from this thesis.....	xiv
Chapter 1: Introduction to the study	15
Introduction	15
Section 1: Introduction to the study	18
Research Problem.....	18
Purpose of the study	19
Aims of the study	20
Research questions	20
Research design.....	21
Significance of the study	23
Section 2: Background to the study	24
Problems with framing radiography as a technical endeavour.....	25
Radiography: A complex, specialised and humanistic profession	34
Hospital to undergraduate education and radiographic qualification.....	36
The evolution of radiography as support for medical diagnostics	42
Image production, interpretation and communication: interprofessional role overlap	47
Communicating the results of radiographic interpretation	53
Legal and ethical challenges of rural radiographic practice	55
Overview of the thesis.....	64
Summary.....	66
Chapter 2: Literature Review	67
Introduction.....	67
Literature review—method	67

Radiologists' reports - delays and absences.....	69
Radiographic interpretation.....	72
Diagnostic Error in Radiographic Interpretation.....	76
Multidisciplinary Radiographic Interpretation	85
Communication with referring clinicians: limitations and management.....	87
Radiographer Abnormality Detection Schemes	89
Disclosure to patients: difficulties and ethical implications.....	95
Summary.....	101
Chapter 3: Theoretical Perspectives	103
Introduction.....	103
Establishing the need for a humanistic theoretical framework	104
A theoretical framework for examining the social and cultural nature of rural radiographic practice.....	106
The social construction of rural radiographic practice	116
The use and value of ethical theories for examining rural radiography	118
Summary.....	123
Chapter 4: Research Methods.....	124
Introduction.....	124
Research Design	125
Study set up.....	128
Ethical considerations	128
Study Setting	130
Study Participants.....	133
Determining population size	133
Data Collection and Analysis	134
First Data Collection Phase – The Questionnaire	135
Development of the questionnaire.....	135
Ensuring rigor in the questionnaire	138
Validity of the questionnaire	138
Construct Validity	138
Content validity	140
Piloting the questionnaire through expert evaluation.....	140
Distribution of the questionnaire.....	142
Managing the questionnaire data.....	145

Analysis of the questionnaire data	146
Demographic Profile of Questionnaire Respondents	151
Second Data Collection Phase – The Interviews	152
Recording rural radiographers’ experiences of practice through interviews.....	152
Interview structure.....	154
Piloting the interview	155
Inviting the participants to interview.....	156
Sampling strategies	156
Recording and transcribing the interview	159
Data Analysis Techniques.....	160
Preparing qualitative data as text for analysis	161
Analysis of the qualitative data set.....	161
Reflective Journal.....	167
The researcher as a rural radiographer	168
Establishing trustworthiness of the study.....	170
Confirmability	171
Transferability	172
Dependability	172
Credibility	173
Summary.....	173
Chapter 5: Radiographic interpretation, communication and disclosure of radiographic opinion: the pre-conditions.	175
Introduction.....	175
Beyond the Technical	177
The Diagnostic Gap	183
(i) Delay in Reporting.....	183
(ii) Perceived health professional inadequacies in image interpretation	187
(iii) Radiographers triaging patients based on their radiographic images	189
Strategies radiographers employ for responding to the diagnostic gap.....	192
The strategies that radiographers employ to alert the radiologist.....	192
The strategies that radiographers employ to alert the referring clinician.....	194
Factors that inhibit radiographers’ actions to close the diagnostic gap	196
(i) Informally acquired radiographic interpretation skills	197
(ii) Radiographers are not always confident in their radiographic interpretation	200

(iii) Referrers may ignore radiographers' radiographic interpretation	207
Navigating the diagnostic gap with referrers	209
(i) Referrers Seeking Radiographers' Opinions	210
(ii) Patient's treatment initiated on rural radiographer radiographic interpretation.....	213
(iii) Communicating radiographic opinion to the referring clinician.....	215
(iv) Language games for communicating radiographic opinion to the referrer.....	216
Summary.....	218
Chapter 6: Rural Radiographers and Disclosure of their Radiographic Opinion to Patients.....	220
Introduction.....	220
Disclosure of radiographic opinion to patients	221
Radiographers' understanding about responsibility to disclosure information	221
Factors that modify radiographers' level of disclosure to patients.....	226
(i) Radiographer's assessment of the patient.....	226
(ii) Legal Considerations	231
(iii) The perceived significance of the pathology identified on the radiographic image	232
(iv) Wanting to avoid causing the patient to worry	235
Filtered Truth	236
(i) Language of full Disclosure.....	237
(ii) Language to minimise disclosure	238
(iia) White lies	238
(iib) Amorphous language	240
(iic) Radiographer's whisper	242
(iii) Language to avoid disclosure	243
Summary.....	246
Chapter 7: Discussion of the Findings.....	248
Introduction.....	248
Diagnostic Gap Discussion	248
Understanding disclosure to patients, truth telling and lies.....	250
Radiographers filtering the truth.....	252
The hierarchical nature of Australian radiology	256
Radiographer-Referrer Game.....	260
Ethics and perception of diagnostic duty	267
Ethics of Care.....	272

Summary.....	274
Chapter 8: Conclusion.....	276
Introduction.....	276
Summary of the thesis.....	276
Achieving the research aims.....	278
Answering the guiding questions	281
Answering the overarching research questions.....	286
Significant contributions.....	287
Limitations.....	289
Recommendations	290
Concluding statement	293
References	299
Appendices	320

List of Figures

Figure 1 Radiographic qualification

List of Tables

Table 1 Diagnostic Radiography Courses offered in Australia
Table 2 RRMA classification
Table 3 Inclusion/Exclusion criteria
Table 4 Questionnaire return rates
Table 5 Gender Distribution
Table 6 Facility for training and preparation for rural practice
Table 7 Relationships between coded data and theme ‘diagnostic gap’
Table 8 Porter’s Interactions compared with radiographers’ actions

Abbreviations and Acronyms

ABS	Australian Bureau of Statistics
AHP	Allied Health Professional
AHPRA	Australian Health Practitioner Regulation Agency
AIR	Australian Institute of Radiography
ALARA	As Low As Reasonably Achievable
APWG	Advanced Practice Working Group
ARIA	Accessibility/Remoteness Index of Australia
ASGC	Australian Standard Geographical Classification
CINAHL	Cumulative Index to Nursing and Allied Health Literature
COAG	Council of Australian Governments
CPD	Continuing Professional Development
CR	Computed Radiography
CT	Computed Tomography
ED	Emergency Department
ESP	Expanded Scope of Practice
FTE	Full Time Equivalent
FRANZCR	Fellow of the Royal Australian and New Zealand College of Radiologists
GP	General Practitioner
kV	kilovolts
IPP	Interprofessional Practice
ISRRT	International Society of Radiographers and Radiologic Technologists
LHMU	Liquor, Hospitality and Miscellaneous Workers Union
mA	milliamperes
MIU	Minor Injuries Unit
MRI	Magnetic Resonance Imaging
MRTRBWA	Medical Radiation Technologists Board of Western Australia
ms	milliseconds
NPDP	National Professional Development Program
PACS	Picture Archiving and Communication Systems
PDY	Professional Development Year
RANZCR	Royal Australian and New Zealand College of Radiologists
RAD	Radiographer Abnormality Description
RADS	Radiographer Abnormality Detection Scheme
RIS	Radiological Information Systems
RMIT	Royal Melbourne Institute of Technology
ROF	Radiographers Opinion Form
RRMA	Rural, Remote and Metropolitan Areas
RRPAB	Rural and Remote Practitioners Advisory Board
SHO	Senior House Officer
SoA	Statement of Accreditation
SoR	Society of Radiographers
UK	United Kingdom
USA	United States of America
VSoA	Validated Statement of Accreditation
WACHS	Western Australian Country Health Service

Publications arising from this thesis

Papers

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Chapter 1: Introduction to the study

Introduction

Radiographers are frontline health professionals primarily seen as responsible for the production of radiographic images. Interpretation of these radiographic images is an integral component of the provision of diagnostic radiology. In Australia this radiographic image interpretation and provision of report is provided by a radiologist. In rural Australia, widespread shortages and geographic dispersion mean a radiologist is not always on site (Smith et al., 2009b). Technological advances such as teleradiology allow for a radiologist to provide reporting from a site geographically separate from the medical imaging department (McConnell et al., 2012). Nevertheless, in rural areas there is a widening gap between service demands and the availability of a radiologist (KPMG, 2009; Smith et al., 2009a). As a consequence, in rural areas the responsibility for interpreting radiographic images often falls provisionally to the referring clinician¹.

Radiographic image reading involves complex decision making and is subject to errors and biases. Misreading of radiographic images by referring clinicians is a source of error with the potential for significant detrimental consequences for patients². In rural and remote clinical practice, where there is often no attending radiologist, rural radiographers work closely with referring clinicians in image interpretation (Smith et al, 2009b). This complementary role between radiographers and referring clinicians can reduce misdiagnosis and positively impact on patient care (Smith et al , 2009b) because collaboration has been shown to mitigate or even eliminate error (Jones and Crock, 2009). Radiographers' radiographic opinion is therefore, a valuable asset to referring clinicians by assisting them in reaching a rapid and accurate diagnosis and so optimising patient care (McBrien, 2005; Smith, 2008; Smith et al 2009b; McConnell et al., 2012). This places radiographers in a difficult position because radiographic interpretation was effectively wrested from their official scope of practice in 1925 (Price, 2001) and as a

¹In Australia patients do not present directly to a medical imaging department but must be referred for diagnostic imaging by another medical practitioner (Pitman, 2006).

² The term patient has been used to refer to those individuals who have undergone radiographic examination as this is the term commonly employed by Australian radiographers and does not carry with it the value laden implications that the biomedical model may infer.

consequence few radiographers have been specifically trained in radiographic interpretation (Smith et al 2009b). Instead radiographic interpretation and formation of a radiographic opinion are largely considered to be the sole responsibility of doctors and more recently nurse practitioners. As a result, few formal pathways for radiographers to communicate their radiographic opinion exist. This study will show that this has resulted in radiographers adopting a number of informal strategies to navigate this largely uncharted territory. Even radiographers who are members of the Australian Institute of Radiography (AIR) and so may be guided by Australian Institute of Radiography's *Guidelines for professional conduct for Radiographers, Radiation Therapists and Sonographers* which advises radiographers to '...alert medically significant findings to the medical personnel responsible for the patient's treatment and at the request of such personnel ... provide an opinion that lies within their knowledge and expertise' (Australian Institute of Radiography, 2007, p. 3) are not provided with a pathway for the provision of this opinion. This is of concern because the communication of radiographic opinion is an important area of radiographic practice but the literature instead tends to focus on describing technical aspects. This thesis has important ramifications for the future viability of the field in rural areas in terms of workforce planning, quality and safety and the development of a rigorous evidence base for informing practice decisions.

As well as the responsibility to produce radiographs, radiographers are often concurrently triaging patients. Triage involves assessing a patient's clinical status based upon the identified radiographic abnormality. When radiographers identify radiographic abnormalities that require medical attention they are often faced with ethico-legal dilemmas related to when and to whom they should communicate that information. The ambiguity surrounding the professional responsibility for interpretation, communication and disclosure of clinical information to patients and referrers means these practices are rarely spoken about. These difficulties are magnified in rural practice because geographic location and the frequent unavailability of a radiologist mean radiographers are largely alone and unsupported in their decision making in relation to interpretation and communication of their opinion. What this suggests is that the practice of rural radiography involves much more than a set of technical skills: it involves complex human interaction. This is of concern because the

field of radiography is largely recognised for its technical contributions to healthcare, which is particularly apparent in the Australian government's healthcare reform strategies.

The Australian Government has commenced major reform in healthcare delivery (National Health and Hospitals Network, 2010) and the way some strategies are being framed will potentially impact upon the field of radiography. Reform is typically framed within urban-centric perspectives. The reforms include innovative strategies such as interprofessional practice (IPP), advanced practice and role substitution. Urban-centrism however, obscures important considerations for rural practice because IPP and advanced practice appear to already exist in rural practice. The Advanced Practice Working Group (APWG) auspiced through the Australian Institute of Radiography (AIR), provides a model for advanced practice of radiographers, but the APWG recognises that the details for such a framework require input from the stakeholders including rural radiographers (Smith et al., 2009a; Freckelton, 2012). Furthermore, strategies such as role substitution reveal how the complex field of radiography is poorly understood.

To suggest that the professional role of a radiographer can be substituted by a lesser qualified worker reflects how radiographers are largely understood as technicians. The literature review shows the prevalence of radiography being framed within a discourse of technical expertise. This study departs from the dominant understanding of radiography as a technical pursuit to instead conceptualise radiographic practice as a complex humanistic endeavour. Radiographic image production, interpretation, communication and disclosure combine technical and humanistic aspects within the role of the rural radiographer. Rural radiography can therefore be conceptualised as a humanistic endeavour as rural radiographers interact with referrers, patients and healthcare colleagues.

Focussing on the technical aspects alone obscures the complexities of the human endeavour inherent in the rural radiographer's role resulting in this aspect of rural radiographic practice being poorly understood. As a complex humanistic healthcare field, rural radiography is fraught with legal and ethical challenges that are specific to the rural context. The ways radiographers respond to these challenges are not well

understood because the humanistic aspects of radiography are hidden. A later section in this chapter argues that the historical evolution of radiography within the biomedical field has resulted in blurred professional boundaries which make radiographic interpretation, communication and disclosure responsibilities unclear. The hidden and unspoken nature of rural radiographers' interpretation of radiographic images, communication and disclosure of their radiographic opinion to referrers and patients is the primary concern of this thesis.

This chapter serves to introduce the study and is presented in two sections. The first section introduces the study and the second section contextualises the study by outlining the background information pertinent to understanding radiography as a complex and specialised profession rather than a technical endeavour.

Section1: Introduction to the study

To introduce the study this section outlines the research problem, purpose, aims, questions research design and significance.

Research Problem

The field of radiography is framed within a dominant technical discourse. It is this heavy focus on technical dimensions that puts radiography at risk of becoming marginalised because the ambiguity surrounding the professional responsibility for radiographic interpretation, communication and disclosure of radiographic opinion to patients and referrers are practices that are rarely spoken about. This is of significance because a large proportion of rural radiographic practice is not well described and so is missing from the evidence base. Whenever a gap exists in an evidence base, healthcare professionals are forced to find alternative ways to acquire the knowledge necessary to inform their decision making.

It has been recognised that as radiographers located in rural areas navigate their way through rural radiographic practice, they acquire an additional and unique set of skills that are essential for high quality and effective practice (McBrien, 2005). The

way in which rural radiographers respond to both patients and referrers is informed by that unique sphere of knowledge that has evolved through their shared experience of clinical practice in rural settings. This sphere of knowledge contributes as equally to an effective outcome for the patient to a radiographic examination as the radiographer's technical expertise in image acquisition. This knowledge is not well described in the radiographic literature nor does it seem to be commonly discussed amongst radiographers and their health care colleagues, alluding to its informal and tacit nature. It seems that rural radiographers' tacit knowledge relating to radiographic interpretation, communication and disclosure has not been subjected to empirical research and theoretical explanation.

Understanding the tacit knowledge used by rural radiographers in everyday practice is critical if radiographers are to position themselves to respond to the contemporary context of healthcare and for appropriately preparing newly graduated radiographers for the unique challenges of rural radiographic practice. The unprecedented level of health reform currently being experienced in Australia demands a critical review of the role and responsibilities of health professions, including radiography, in order to accurately inform future workforce and education. Pressure on the health dollar, workforce shortages and the blurring of professional boundaries, particularly in rural environments, are amongst the many challenges facing radiography. There is an urgent need to subject radiography's traditional professional boundaries, expertise and clinical expectations to scrutiny, and nowhere is this more important than in the rural setting. It is for these reasons that research into rural radiography is urgently required.

Purpose of the study

The study's purpose was to describe and interpret authentic accounts of rural radiographers' experiences in order to generate substantive theory of radiographic interpretation and communication and disclosure of their radiographic opinion, with a specific focus on plain film radiography. The study sought to compile a detailed exploration of the dilemmas and activities experienced by rural radiographers in relation to radiographic interpretation, communication and disclosure. From these descriptions of rural radiographic practice the study sought to interpret the complex ethical and social

dimensions of radiographers' practice, in order to provide insight into the practice arena of the rural radiographer that takes account of their social, cultural and historical world. In achieving the study purpose, there was the expectation to make visible and theoretically explain the practice world of the rural radiographer.

Aims of the study

The broad aim of this research was to contribute to the field knowledge informing professionals, educational and policy decisions relating to radiographers' scope of practice by:

- (i) Generating substantive theoretical insights into the practice world of rural radiographers and specifically around their experience of communication and disclosure of their radiographic opinion;
- (ii) Addressing the lack of 'radiographer voice' and the emphasis on the technological aspects of the radiographers' work evident in the existing literature;
- (iii) Capturing the ways in which rural radiographers understand their responsibilities relating to the interpretation of radiographic images, communication and disclosure of their radiographic opinion, and
- (iv) Determining how this understanding informs contemporary radiographic practice.

Research questions

The following research questions address the aims of the study:

1. How do rural radiographers experience, interpret and understand radiographic interpretation, communication of their radiographic opinion with referrers and disclosure of their radiographic opinion to patients?
2. How do rural radiographers construct ways to negotiate communication and disclosure of their radiographic opinion within their practice world?
3. How might this inform the preparation of radiographers and other healthcare professionals who will be providing radiographic services for rural Australia in the future?

This study was guided by a series of questions that enabled the social constructionist intent of the study to be realised. The guiding questions were:

- How do rural radiographers develop radiographic interpretation skills?
- What do rural radiographers consider to be the issues with communication with referrers and disclosure of their radiographic opinion to patients?
- What strategies do rural radiographers employ to address these issues and why?
- What beliefs and values guide rural radiographers' decisions and behaviours around communication and disclosure of their radiographic opinion?

Two additional guiding questions were used to capture demographic data. They were:

- Who are rural radiographers and how are they defined?
- What is the profile of healthcare professionals providing radiographic services to rural Australia?

Research design

In this section the research design for this study is briefly outlined and a more in-depth discussion of this appears in chapter 4.

The ways in which rural radiographers respond to the complex humanistic aspects of their practice are shaped by their local context in which they work their workplace practices and more broadly the way in which radiography has evolved over time. These social, cultural and historical aspects that influence radiographic practice do not typically feature in radiographic literature; however, they form a central premise on which this study was designed. In order to allow the complexity of rural radiographic practice to be captured and examined, this study combined social constructionist, socialisation and ethical theories into a theoretical framework. To capture the depth of information necessary for such an inquiry a two stage, exploratory interpretive study was developed utilising a paper based questionnaire and in-depth semi-structured interviews. These two data collection techniques were used to collect information and to provide authentic accounts of rural radiographic practice from radiographers currently practising in rural areas of Australia. The purpose of the

questionnaire was to build on the findings from the literature review and to provide a demographic profile of rural radiographers as there is little current data on the rural allied health workforce of which radiographers form part (Keane et al., 2008; KPMG, 2009; Scott and Cheng, 2010).

The emerging findings from the questionnaire provided the foundation for the second stage of the study, in-depth semi-structured interviews again with radiographers providing radiographic services in rural Australia. The interviews were conducted either face to face or by telephone. The qualitative data set was subjected to thematic analysis in order to identify, analyse, and report themes and interpret the data (Braun and Clarke, 2006). This analysis revealed a number of strategies that radiographers have adopted in relation to communication and disclosure of their radiographic opinion. Rural radiographers' actions are guided by context and the complex actions and interactions that have lead them to adopt certain communication and disclosure strategies. The strategies that radiographers have adopted were theorised in order to provide some understanding of this aspect of rural radiography. Radiographers' sense of professional and diagnostic responsibility and their construct of their role in patient care, drive them to do what is best for the patient which can be understood within the framework of the ethics of care.

The research design and methods used in this study were useful for describing and interpreting data to make sense of the socially, historically and culturally shaped understandings that rural radiographers have of radiographic interpretation, communication and disclosure. It also allowed theoretical and practical understanding of rural radiographers' involvement in radiographic interpretation, communication and disclosure of their radiographic opinion to be generated. The findings from this study may contribute to the knowledge base informing the development of healthcare models that reflect contemporary rural radiographic practice and which promote safety and quality.

Significance of the study

The significance of this study is fourfold.

Firstly, the research design provides the field of rural radiography with new possibilities by moving understanding beyond a technical discourse to a more complex humanistic perspective. So far this chapter has shown the disabling effects the dominant technical discourse for understanding radiography has for the field at a political level. By re-conceptualising rural radiography as a human endeavour, the research is significant because it presents a deeper and more realistic account of the profession and its practices.

Secondly, the theoretically informed research design provides the field of rural radiography with a new research framework that is appropriate for describing, interpreting and explaining the complex humanistic nature of rural radiographic practice. The literature review shows how the majority of radiographic research draws upon the dominant positivistic paradigm and its quantitative methods. If rural radiography is to be reconceptualised as a human endeavour, alternative research perspectives are required. This study is significant in that it provides other researchers with a sound, theoretically informed research framework for examining rural radiographic practices in a way that acknowledges their inherent humanistic dimensions.

Thirdly, the findings provide a much needed rural radiographic voice for informing rural workforce planning models that are innovative in nature while considering the unique rural context requirements. The Australian healthcare system is poised for considerable redesign to meet current and predicted demand (National Health and Hospitals Reform Commission, 2009; Health Workforce Australia, 2012). In particular the Australian rural healthcare workforce is in crisis and reform is essential (Health Workforce Australia, 2012). While other countries have developed new models for the radiographic workforce, Australia urgently requires discipline-specific radiographic research that is relevant to the rural context to inform similar models (Smith et al., 2009a).

Finally, the findings contribute to current debates about how to improve the quality and safety of rural radiographic practice. The proposed changes to frameworks and professionals' scopes of practice, particularly plans for role substitution in radiography, require careful management to avoid compromising quality and safety in health service delivery for rural Australia (Productivity Commission, 2005; Edwards et al., 2009; Smith et al., 2009a; Freckelton, 2012). While the literature recognises that rural radiographers are participating in radiographic interpretation and communication of their radiographic opinion to referrers (Hall et al., 1999; Smith and Lewis, 2002; Cook et al., 2004; Nuss, 2007; McConnell et al., 2012), the ways in which radiographers undertake interpretation and communicate their findings is poorly understood. This research seeks to address the gap in knowledge about the influencing factors and ways in which rural radiographers undertake interpretation, communication and disclosure of radiographic information. Such findings are a significant contribution to the existing evidence base because patients '... may question the radiographer on what is seen in the X-ray' (Dimond, 2002, p. 172) and radiographers are unsure of what information they should disclose to patients. Despite this questioning, other studies (Lewis 2002) show radiographers are unsure of the information they should disclose in such interactions. Without these deeper understandings of rural radiographers' interpretation, communication and disclosure practices, rural radiographers may continue to operate within unclear professional boundaries and potentially place both themselves and patients at risk.

Section 2: Background to the study

In order to situate the study, this section provides the background and context for the study. An overview of rural radiography and the Australian healthcare workforce, accompanied by essential information about radiography itself, provided the broad context of the study. Here the influence of rurality and the history of both radiography and medicine are discussed in relation to the construction of contemporary radiography as a complex, specialised and humanistic profession. The key argument to emerge from this section is that there is a lack of definitional clarity and lack of accurate knowledge of the practice world of the rural radiographer which has contributed to the hidden nature of radiographic interpretation, communication and disclosure.

Problems with framing radiography as a technical endeavour

Rural radiographers are healthcare professionals and to understand the practice world of the rural radiography it is essential to explore and describe the healthcare environment in which they work. A geographically large country such as Australia faces significant problems in meeting the healthcare needs of its population (Humphreys et al., 2008; Scott, 2009; Health Workforce Australia, 2012). Australian Health Care is structured according to the same models that evolved in the 19th century and developed throughout the 20th century (Duckett, 2005b). Although the Australian healthcare workforce has become more diverse and specialised as a result of the evolving healthcare environment (KPMG, 2009), the current healthcare workforce cannot deliver sustainable health services into the future (Health Workforce Australia, 2011; Freckelton, 2012).

Despite the diversity and specialisation emerging in the Australian healthcare workforce, radiography is subsumed within the rubric of allied health. The current health workforce is generally considered to be comprised of doctors, nurses and allied health professionals³ (Duckett, 2005a; Willis et al., 2005; Mills et al., 2010). While each health profession has its own educational preparation and practice (Duckett, 2005b; Willis et al., 2005), the specialised knowledge and skills of radiographers are difficult to isolate because they are grouped together with several other allied healthcare professions that offer a wide range of diagnostic or therapeutic services (Keane et al., 2008). Even as a collective of different health professions Allied Health Professionals, including radiographers, constitute approximately 18% of the total Australian healthcare workforce⁴ (Keane et al., 2008, p. 1). Radiography, like all health professions in Australia, is experiencing current and projected workforce shortages which not only obscure the field's capacity to make visible its specialised nature but limit radiographic service delivery (KPMG, 2009; Health Workforce Australia, 2011; Health Workforce Australia, 2012).

³ Allied health professions are those professions other than medicine, nursing and health administration that are involved in health care. Included with in these nineteen professions is radiography (Tasmanian Department of Health and Human Services 2003).

⁴ The size of the Australian Health Care workforce has never been greater (Health Workforce Australia, 2011) and accounts for 6.7% of the total Australian workforce and of this 43% are healthcare professionals (Duckett, 2005b).

The shortages of healthcare professionals are not uniformly distributed throughout Australia and are dependent upon factors such as the speciality of the healthcare profession and geographical location (KPMG, 2009; National Health Workforce Planning and Research Collaboration, 2011). With the exception of nursing, the greater the distance from a major centre the greater the population relative to the number of healthcare professionals (Productivity Commission, 2005, p. 204; Mills et al., 2010). The maldistribution of the workforce shortage is evident in the allied health workforce where not only is there a national shortage of allied health professionals (Productivity Commission, 2005; Keane et al., 2008; Lowe et al., 2009), but the shortages are greater in rural areas (Keane et al., 2008; Lowe et al., 2009; Wilson et al., 2009; Chisholm et al., 2011). The determinants as to the presence, or indeed absence of a healthcare professional, are the size and location of the rural or remote community (Lyle, 2002; Smith et al 2008a). Not only are allied health professionals not present in large numbers in rural practice, but there exists a disparity between the number of rural compared to urban allied health professionals (Blue, 2002; National Health and Hospitals Network, 2010). The ratio of allied health professionals to population has been reported as 2.66 per 10 000 in capital cities but falls to between 1.41 and 1.81 in regional areas to 1.17 remote areas and 0.60 in very remote areas (Chisholm et al 2011, p. 81). Ascertaining the number of radiographers working in rural Australia with any accuracy is difficult. The total Australian Medical Imaging Professionals population, of which radiographers are part, according to 2006 census data, stands at 10,146⁵ (Australian Bureau of Statistics, 2006). The radiographer population also drawn from the 2006 census data is estimated at 5,958 (Scott and Cheng, 2010) with rural radiographers constituting a very small subset of the total number of Australian radiographers (Blue 2002). Data from the 2006 census allows the rural and remote Medical Imaging Professionals workforce to be estimated at 2,138⁶ individuals or 18.8% of the total Medical Imaging Professionals Workforce (Australian Bureau of Statistics, 2006).

⁵ It should be noted that discrepancies occur in ABS reported data due to the confidentiality requirements of the ABS relating to small cell sizes, where in order to fulfil the requirements of the *Census and Statistics Act 1905* in cases where the tables produce cells with very small counts random adjustments are made to the data to avoid the risk of releasing data that may allow identification of a particular organisation or individual (Lowe and O’Kane, 2004).

⁶ Employing the methodological approach adopted by Lowe and O’Kane (2003) populations classified in the ASGC classes of Inner Regional Australia, Outer Regional Australia, Remote Australia and Very Remote Australia were added together to provide representative data on the number of rural and remote Medical Imaging Professionals.

Not only is it difficult to accurately determine the number of Australian rural radiographers, but recent studies have exposed a lack of current and detailed data on all the rural allied health workforce (Keane et al., 2008; KPMG, 2009; Scott and Cheng, 2010). This lack of current data on the rural allied health workforce has resulted in both the rural radiographic workforce and the field of rural radiography, along with the dilemmas and activities experienced by rural radiographers, being poorly documented. While there is little current information on rural radiography and there are few recent figures detailing the vacancy rates in the radiography workforce, there is reportedly an ongoing undersupply of radiographers within the Australian health workforce particularly in rural areas (Tasmanian Department of Health and Human Services, 2003; Victorian Government, 2005; Smith et al., 2009a).

These workforce shortages across a number of healthcare professions have resulted in an increasing reliance on overseas trained healthcare professionals (Productivity Commission, 2005; Health Workforce Australia, 2011; Health Workforce Australia, 2012). A Council of Australian Governments (COAG) National Health Workforce Agency scheme has a \$63 million budget over four years to advertise healthcare vacancies and to train overseas recruits to meet Australian registration requirements (KPMG, 2009, p. 2). Looking overseas for healthcare workers to fill the void in Australia may not provide the answer, as it has been estimated that internationally there is a current shortage of 2.3 million physicians, midwives and nurses across 57 countries (KPMG, 2009). Because radiography is subsumed within allied health, sourcing data on the specific reliance in Australia on overseas trained radiographers is difficult. Diagnostic radiography however, is one of the occupations that has been identified by the Department of Education, Employment and Workplace Relations as being in short supply which has resulted in diagnostic radiography being listed as one of the medical imaging professions in demand for general skilled migration applicants (Australian Government Department of Immigration and Citizenship, 2010). Introducing overseas trained healthcare workers to perform radiography adds a further level of obscurity to rural radiographic practice because the field is not well understood from the Australian perspective.

The current health workforce shortage has also impacted upon the Australian radiologist workforce, which forms part of the medical imaging workforce along with

radiographers, and this has a modest reliance on overseas trained radiologists (Jones, 2002). A possible explanation for some reliance on overseas trained radiologists is that the current Australian radiologist workforce is currently undersupplied (KPMG, 2009). The same difficulty encountered with identifying current data on radiographers was also apparent in identification of data on the Australian radiologist workforce. A survey of public sector radiologist vacancies conducted in 2001 revealed 37 FTE unfilled positions (Jones, 2002) and there is continued concern that the workforce shortages are not improving. The KPMG report citing the 2004 RANZCR Workforce Survey reveals that the RANZCR found:

a significant possibility of some widening in the gap between supply and demand of radiologist services over next few years, assuming historical and predicted supply and demand trends continue. The degree to which productivity gains (for example, via digital image management systems) can continue to bridge this deficit over the next few years is unknown, but is possibly limited (KPMG, 2009, p. 24).

The shortage of radiologists will impact on medical imaging departments throughout Australia and consequently on radiographers because the ongoing demand for radiology services will see some responsibilities fall on radiographers.

Additional to the current shortage of radiographers and radiologists, there are also a number of factors that will result in an unprecedented demand on both healthcare services and the healthcare workforce in the future. Already within radiography, technological advances have seen the evolution of the subspecialties of Computerised Tomography (CT), ultrasound and Magnetic Resonance Imaging (MRI). In Australia between 2000 and 2010, the provision of subspecialties of CT and ultrasound services increased by 100% and MRI by 200% (Smith, 2013). Reviewing the Australian Government Department of Health and Ageing Medicare Group reports reveals that while cross-sectional imaging modalities like CT, US and MRI have seen the greatest increases, radiographic imaging is also increasing at a substantial and steady rate with radiographic imaging remaining the most common type of medical imaging service provided (www.medicareaustralia.gov.au/statistics/mbs_group.shtml accessed 20.04.2013). This suggests, therefore, that we are not seeing substitution of radiographic imaging with other modalities but rather that radiographic imaging continues to be a mainstay of diagnostic imaging services. Furthermore in rural health care facilities

where resources are often limited (Smith et al 2008a) cross sectional imaging modalities may not be available suggesting a greater reliance by rural General Practitioners (GPs) on radiographic imaging.

If healthcare reform is to be effective it is important that some clarity about radiographic practice is achieved because demands on Australian healthcare are going to increase. Demographic predictions for Australia suggest that over the next 20 years, the ageing of the 'baby boomer' generation will result in an extraordinary demand being placed on Australian healthcare services (Duckett, 2005b; Schofield and Beard, 2005a). In turn, demand on health resources is also increasing because, although the life expectancy of Australians has increased over the last century, the disability-free life expectancy has decreased (Duckett, 2005b; Mitchell et al., 2008; KPMG, 2009; Health Workforce Australia, 2012). Radiography tends to draw parallels with the nursing profession (Decker and Iphofen, 2005) and it has been predicted that, if nurses of the baby boomer generation continue to leave the workforce at the same rate as previous generations, this will result in a loss of more than half the current workforce within fifteen years (Schofield and Beard, 2005b). This demand will necessitate changes in the healthcare workforce (Duckett, 2005b; Productivity Commission, 2005; Mitchell et al., 2008; Freckelton, 2012) because workforce planning issues will result. Not only will this generation of baby boomers place pressure on the healthcare system, but the healthcare workforce itself will be caught up in this changing demographic (Schofield and Beard, 2005a; Scott, 2009).

Increased funding has been proposed as a short term solution to alleviate the shortages that exist in the number of healthcare workers. Unfortunately it has also been identified that increasing the number of healthcare workers alone does not offer a sustainable solution (Productivity Commission, 2005). Increasing the supply of healthcare workers in Australia has not led to an increase in meeting the needs of already underserved rural and remote communities (Scott, 2009; Health Workforce Australia, 2011). Rural and remote hospitals cannot provide the range of services that are available in a major centre because rural and remote areas do not have the 'critical mass' in terms of population and infrastructure to support resident specialists (Productivity Commission, 2005). In recognition of this, changes to the roles of healthcare professionals are now being proposed (Duckett, 2005b; Productivity

Commission, 2005; Scott, 2009; Health Workforce Australia, 2011; Freckelton, 2012). Such workforce reform requires initiatives that will enable the healthcare workforce to become more efficient, effective and responsive (Productivity Commission, 2005), which means changes to the roles of healthcare professionals will be necessary for the 21st century. The required shift in workforce design and redistribution of the responsibilities of the healthcare professions (Duckett, 2005b; Freckelton, 2012) demands sound understanding of the nature and practices of rural radiography. Once this level of clarity has been achieved it will be possible to accurately plan for radiography's inclusion in healthcare reforms.

One model for which there is potential within healthcare is for the growing use of inter-disciplinary⁷ and multidisciplinary⁸ teams (Productivity Commission, 2005), which collectively may also be referred to as collaborative (Norsen et al., 1995) or interprofessional practice (IPP) (Smith et al., 2008b). The primary driver for models of care such as IPP is the safety and quality agenda that is pivotal to any healthcare reform. IPP is based on the premise that each of the professionals from the various disciplines involved has its own discrete knowledge and skills (Norsen et al., 1995; Willis et al., 2000; Scott, 2009; Mills et al., 2010) and each of the professionals work together to provide comprehensive patient care (Norsen et al., 1995; Mitchell et al., 2008; Smith et al., 2008b). Holistic patient care is delivered as the individual members of each separate profession function as a team beneath one organisational umbrella (Mitchell et al., 2008). Effective IPP is characterised by communication and relationships built on understanding the discipline of each team member along with an appreciation of the unique role each team member occupies within the team (Mills et al., 2010). The advocates of interprofessional and collaborative practice also look to an increase in the power and freedom to act for the healthcare professionals involved (Willis et al., 2000) as the maintenance of rigid scopes of practice can be counterproductive to quality patient care (Smith et al., 2008b). Changes in the delivery of healthcare services should only occur when benefits to the healthcare system and most importantly the patient can be realised (Hardy et al, 2010).

⁷ Interdisciplinary may be defined as '...in which two or more disciplines cooperate' (Moore, 2005, p. 615).

⁸ Multidisciplinary may be defined as '...involving a number of academic disciplines' (Moore, 2005, p. 782).

Realignment of existing workforce roles or the creation of new roles are other suggested models for improving the health workforce (Productivity Commission, 2005; Freckelton, 2012). The concept of realignment which incorporates cross-skilling and broader scope of practice, falls within expanded scope of practice (ESP), which is currently receiving much attention both within Australia and overseas. This term has crept into the lexicon of many healthcare professional bodies and consequently into the associated literature. Expanded Scope of Practice, as the name suggests, is an expansion from the traditional model of practice for a particular healthcare profession and it is where current models of care may be re-engineered in order to improve both productivity and patient safety (Scott, 2009). Expanded Scope of Practice encompasses healthcare professionals assuming multiple roles (Akroyd, 1990), or acquiring skills that will enable them to perform tasks originally outside of their traditional scope of practice (Verrier, 1991), or simply extending the scope of practice so that healthcare professionals utilise a skill that they already possess (O'Connor, 2005; Freckelton, 2012). A healthcare professional who operates at an expanded scope of practice is professionally autonomous and is accountable for his or her actions (Freckelton, 2012). Once again planning to expand the scope of practice in radiography is contingent on accurate understanding of the field at the foundational level. Without accurate understanding of radiographic practice the field is at risk of planning decisions that may compromise quality and safety.

One proposition to answer workforce planning issues that has potentially major implications for rural radiography is workforce substitution. Whereas expanded scope of practice constitutes health care professionals adopting a broader scope of practice, workforce substitution involves new roles within the healthcare system that may be introduced at the '...less cognitively complex end of the task hierarchy' (Duckett, 2005b, p. 207). It has been suggested that this may be partially achieved with the use of paraprofessionals in healthcare who perform protocol limited tasks under the direction of a health care professional (Freckelton, 2012). The employment of paraprofessionals such as allied healthcare assistants has the potential to reduce the demand for allied healthcare professionals (Duckett, 2005b). A number of areas have already been identified where there is potential for task substitution. Included in this list is the task referred to as 'plain X-ray', where the traditional professional is listed as 'medical imaging technologist' and the substitute professional or assistant is 'X-ray assistant'

(Productivity Commission, 2005, p. 160). Already in the United Kingdom assistant practitioners exist as part of the four tier model for radiographic service delivery (Freckelton, 2012). The concern for radiography is that the proposed new roles in allied healthcare target aspects of radiography that are perceived as ‘less cognitively complex’. There is a risk of inferring that plain radiography is not cognitively complex and the specialised nature of the role of the radiographer is understated. This is a potentially damaging stance for radiography and patient care because the practice world of the radiographer will remain invisible. The risk of such workforce substitution is that pseudo-efficiency is substituted for quality healthcare.

Changes to the healthcare system that may impact on efficiency and effectiveness in any healthcare profession need to be tempered with a framework that maintains or improves quality and safety of care (Productivity Commission, 2005; Edwards et al., 2009; Health Workforce Australia, 2012). A key objective to any workforce reform is ensuring quality, efficient, safe healthcare services (Edwards et al., 2009; Wakefield and Jorm, 2009; Australian Commission on Safety and Quality in Health Care, 2010). This reform must also be effective and financially viable (Productivity Commission, 2005; KPMG, 2009). Furthermore workforce reform can be complex and can have flow-on⁹ effects (Productivity Commission, 2005; Edwards et al., 2009). Concerns regarding the flow-on effects of changes to health care system have been identified in workforce changes. The Productivity Commission report reveals that the Nurses Board of Western Australia and the Victorian branch of the Australian Nursing Federation were concerned that unskilled workers may take on roles that are currently provided by registered professionals thereby lowering safety standards (Productivity Commission, 2005, p. 58).

Rural radiography is one such area where the role of a radiographer as a health professional may be filled by a lesser skilled worker. Already in rural healthcare facilities where the radiographic workload¹⁰ does not warrant employment of a full time radiographer or when the radiographer is a sole practitioner, these radiographic duties

⁹ Flow-on effects refers to consequences of a previous event or change (Moore, 2005, p. 449)

¹⁰ The rule of thumb with regards to patient referral numbers that justifies the employment of a radiographer has been suggested to equate to 2000 referrals per annum (O'Regan, 1991).

fall to remote operators¹¹. There is already evidence that the quality of radiographic images produced by remote operators is below expected standards and this in turn has raised the issue of risk to the patient due to resultant misdiagnosis (Smith and Jones, 2007). A proposal for future workforce substitution similar to that proposed by Duckett (2005b) has been trialled by Queensland Health (Freckelton, 2012). This concept of non-radiographers performing radiography is of concern to several bodies that represent the interests of radiographers, namely the Australian Institute of Radiography (AIR), the Rural and Remote Practitioners Advisory Board (RRPAB) of the AIR and the Liquor, Hospitality and Miscellaneous Workers Union (LHMU). These bodies argue that, as the roles for the medical imaging assistants would mirror those of a Professional Development Year (PDY)¹² radiographer, this raises issues about workforce structuring into the future (Choma, 2009) and the potential for risk to patient safety (LHMU, 2009). The AIR Board also believe that there is risk associated with allowing a minority body the responsibility of irradiating humans (Harvey, 2009). As healthcare professionals, radiographers are responsible for the protection of their patients from excessive radiation (Murphy et al., 2005b; MacKay et al., 2012). Radiographers performing diagnostic radiography operate within a radiation protection principle referred to as ALARA. The ALARA acronym is derived from As Low As Reasonably Achievable where the key intent is that radiation exposure to the patient should be as low as is reasonably achievable (Murphy et al., 2005b; MacKay et al., 2012). The workforce culture necessary to deliver high level technical safety, such as ALARA, is the same culture that values both patient centred care and empathy (Wakefield and Jorm, 2009) which underscores the importance of the humanistic aspects of radiography.

The technical aspects of radiography seem to have effectively overshadowed those aspects that support patient centred care. For example, one of the radiographers interviewed in a study into the field of Magnetic Resonance Imaging (MRI) revealed

¹¹ Remote operators are GPs and nurses who have been specifically trained to provide basic radiographic services in rural and remote Australia where healthcare services are limited by geographical location and population. These remote operators have undertaken a short course in radiography and are licensed according to their individual state requirements to provide a limited range of radiographic examinations (Smith and Jones, 2007).

¹² The PDY program has been replaced with the National Professional Development Program (NPDP). NPDP is 48 weeks FTE completed within three years of graduation that allows a graduate mediated entry into the profession of radiography under the guidance of more experienced radiographers (Australian Institute of Radiography, 2011).

that ‘it must appear to others that we are not doing anything other than pressing the odd button’ (Murphy, 2009, p. 37). Campeau (1999) also supports this claim of radiographers historically being perceived as button pushers and this may account for how such diametrically opposed views on medical imaging assistants as those expressed by Duckett (2005b) and the AIR (Harvey, 2009) may have arisen. Izan Gill, a Queensland radiographer, is quoted on the Liquor, Hospitality and Miscellaneous Workers Union website as having said ‘[b]ecause we make what we do look quick and easy...’ (LHMU, 2009). Radiography appearing to be easy has been identified by others (Goldin, 1979; Campeau, 1999; Decker, 2006) which may have given rise to the assumption that plain radiography is not cognitively complex and only requires simple manual and cognitive skills (Goldin, 1979). It is an assumption that logically would allow planners of health workforce reform to take plain film radiography from the hands of professionals and place it in the hands of paraprofessionals. As long as the misperception of radiographers as technicians remains the dominant picture of the radiographer, the humanistic aspects of radiography and radiographers’ contribution to patient care will continue to be invisible. The following section shows how contemporary radiography is a complex and specialised field that has a strong humanistic focus.

Radiography: A complex, specialised and humanistic profession

The wider community is largely unfamiliar with the complex specialised and humanistic nature of the field of radiography (Campeau, 1999; Murphy, 2001; Decker, 2006; Murphy, 2009). The purpose of this section is to unravel the underestimated and yet complex work environment of the radiographer by examining some key radiographic terms, consider the educational preparation of radiographers and present an overview of the historical evolution of radiography. A key argument to emerge in this section is that the historical development of the field of radiography has established the preconditions that resulted in its colonisation by medicine which has led to role ambiguity and given rise to various legal and ethical challenges for rural radiographers.

The term ‘radiography’ has its origins in Latin and Greek. In Latin the term *radius* denotes ‘a ray’ and in Greek the term *graphein* is used to refer to ‘writing’ or ‘drawing’ (Ahonen, 2008, p. 115). Radiography is therefore simply using X-rays to

produce an image. A radiographic image consists of shades of grey as it represents variations in optical densities that correspond to the imaged structures (Martin, 2007) as a result of the different penetration and absorption qualities of body structures by X-rays (Hay and Hughes, 1983). Substances such as fat and gas are more readily penetrated by X-rays than others such as heavy metals, calcium and bone (Meschan and Farrer-Meschan, 1960). This is why air appears as darker shades of grey on a radiographic image but bone appears as whiter shades of grey. X-rays are by definition a form of electromagnetic radiation but the language of the field of radiography has been complicated because the term X-ray has been metonymically employed as the name for the source of the ionising radiation, the radiology or medical imaging department, the examination and the resultant image (Murphy et al., 2005a). Throughout this thesis the term 'X-ray' will be used for the ionising radiation, 'medical imaging' for the radiology department, 'radiographic examination' for the examination and 'radiographic image' or 'film' for the image produced.

Not only has there been a lack of clarity around some of the terms used in radiography, but the invisibility of the practice world of the radiographer appears to have rendered radiographers as a distinct group of healthcare professionals invisible to their patients. This invisibility has resulted in patients' inability to accurately name the health professionals that perform radiography. This apparent ambiguity ranges from a lack of name '...whoever they were...' (Murphy, 2001, p. 197) to a number of different terms which are used to denote these health professionals. In interviews with MRI patients it was discovered that most of these patients assumed that radiographers were doctors or nurses (Murphy, 2009). Patients have also been reported as referring to radiographers as 'girls' and also as 'nurses', (Murphy, 2001, p. 197). Patients' inability to accurately name the healthcare professional providing radiographic services may be understood because patients are concerned with obtaining a 'clear diagnosis in a safe environment' and not with the identity of the radiographer (Murphy, 2009, p. 36). It is the immediate diagnostic aspect to radiography within a world where patients not only request, but also have a legal and moral right to the diagnostic truth (Schreiber and Winslade, 1987) that presents a difficulty for radiographers as they are not prepared for the complex legal and ethical issues that arise from this humanistic element of patient care. While patients may see radiographers as nameless members of the healthcare

team (Campeau, 1999), this is contrasted by the radiographic profession where several different terms are used in reference to these healthcare professionals.

Some of the different terms that may be used in reference to the healthcare professionals who are specifically qualified to undertake radiography are evident on the website of the Australian Institute of Radiography (AIR)¹³. The AIR is the national organisation that represents Medical Radiation Science Professions in Australia and uses both Diagnostic Radiographers and Medical Imaging Technologist (Australian Institute of Radiography, 2009) to refer to the healthcare professionals who undertake radiography. As the AIR is also a member of the International Society of Radiographers and Radiologic Technologists (ISRRT), this results in inclusion of both of these names in the nomenclature. The incorporation of the term ‘technologist’ into the name of the healthcare professionals who are qualified to undertake radiography emphasises the visible technical dimension of radiography belying the social and humanistic dimensions of this profession. In addition to there being several names to refer to those healthcare professionals who perform radiography, they may hold any one of a number of radiographic qualifications. The multiplicity of qualifications has only added to the acceptance of the use of different terms to refer to radiographers. The number of different qualifications that radiographers may hold has risen as radiography education has evolved and this is explored in the following section.

Hospital to undergraduate education and radiographic qualification

Radiography before the 1920s was self-taught (Tress, 1991) which was a consequence of an emerging new field evolving within an environment where the ‘...professional scientific elite...’ were ‘...thin on the ground...’ (Hamersley, 1980, p. 45). In 1923, the Association of X-Ray Technicians was formed in Melbourne and was supported by radiologists (Tress, 1991). The Association conducted monthly meetings at various X-ray departments where the developments within radiography were discussed (Tress, 1991). Prior to 1940 no formal qualification for radiographers existed, although X-ray attendants could attend lectures in ‘...physics, chemistry anatomy and X-ray practice’

¹³ The Australian Institute of Radiography (AIR) is the peak body that represents Australian Radiographers. The AIR evolved in 1947 from the Radiographers Society of Australia which itself was formed in 1923 (www.air.asn.au/ website accessed 06.07.2010).

(Baird, 1992, p. 406). After 1940 an X-ray technician certificate was awarded to those who completed a course of study at Royal Melbourne Institute of Technology (RMIT) (Baird, 1992). In 1950 the Conjoint Board was formed to oversee radiography training (Lewis, 2003, p. 61). The Conjoint Board consisted of members from the Australian Institute of Radiography (AIR) and the Royal Australasian College of Radiologists. Radiologists, therefore have historically been situated in a way that exerts influence over radiographic education, a move that ‘...is generally agreed to have been detrimental to the progress of developing a professional body of unique radiographic education’ (Lewis, 2003, p. 61).

In the period from 1950 until 1977 radiography students were employed as trainees at approved hospitals (Baird, 1992, p. 406). The educational requirement for radiography training at this time was provided by the RMIT as an out of hours three year course of study. Radiographic syllabi as a professional course, which provided the foundation for the pre-university based radiographic qualification, such as that provided by RMIT, was constructed to support the attainment of a body of knowledge for the purpose of achieving a successful radiographic examination (Hammick, 1995). Successful completion of study at RMIT rewarded the trainees with an associate diploma, which in conjunction with completion of the prescribed clinical requirements of the Conjoint Board, enabled the trainee to apply to the Conjoint Board for a Diploma and admittance to the AIR as a member, and once granted allowed the trainee to seek employment as a radiographer.

A similar model of radiographer education played out in Tasmania with Medical Imaging Departments employing radiography students and the education requirement initially being provided by RMIT but later by the Hobart Technical College. In 1978 a fulltime three year Diploma with a core component of clinical placement was introduced at RMIT (Baird, 1992, p. 406), and so the move from hospital based training to university degree began. The education requirements for radiography education in Tasmania also saw a change with a move to the control of the University of Tasmania in 1985, which saw the qualification upgraded from an Associate Diploma to a Diploma. In Tasmania, the last hospital based group of diagnostic radiography students graduated in 1993. It was the move from Diploma to Degree that saw the demise of radiographer training in Tasmania as the limited number of radiography students was not supportable.

Now it is not possible to graduate as a radiographer within the Tasmanian university system; however, Tasmanian radiography students may enrol cross-institutionally and complete a double degree by studying a combination of University of Tasmania and Charles Sturt University subjects. A chronology outlining the developments within radiography and the evolution of radiographer training is included in the appendices (Appendix A).

Radiography was one of the last health professions to undertake the move from diploma to degree (Baird, 2008). This late move to a full time university based degree makes radiography a relative latecomer to university based education (Cowell, 1999; Duckett, 2005a) and the intellectual and professional credibility that universities contribute to a profession. The shift in radiography education from hospital based training to university based degree was completed in 1992 (Lewis, 2003). Students entering undergraduate diagnostic radiography courses in Australia are generally academically in the top 20% of school leavers (Smith, 1995; Smith and Lewis, 2002) and many Australian diagnostic radiography students have attained tertiary entrance scores of 90 or above (Smith, 2008). In Australia, diagnostic radiography education is diverse and is offered by nine universities. Diagnostic radiography courses are offered by universities in Queensland, New South Wales, Victoria, South Australia and Western Australia (Australian Institute of Radiography, 2009) as can be seen in table 1.

University	Awarded Degree
Queensland University of Technology	Bachelor of Medical Imaging Science
The University of Newcastle	Bachelor of Medical Radiation Science (Diagnostic Radiography)
The University of Sydney	Bachelor of Applied Science (MRS) Diagnostic Radiography
Charles Sturt University ¹⁴	Bachelor of Medical Radiation Science (Medical Imaging)
RMIT University	Bachelor of Applied Science (Medical Radiations)
Monash University	Bachelor of Radiography and Medical Imaging
University of South Australia	Bachelor of Medical Radiation Science (Medical Imaging)
Curtin University of Technology	Bachelor of Science (Medical Imaging Science)
Central Queensland University	Bachelor of Medical Imaging

Table 1 Diagnostic Radiography Courses offered in Australia

¹⁴ Tasmanian Radiography students also graduate from Charles Sturt University with this qualification along with a Bachelor of Health Science from the University of Tasmania.

The courses are either three year undergraduate courses which require the graduate to complete a National Professional Development Program (NPDP) in order to gain professional accreditation, or a four year course (Australian Institute of Radiography, 2012; Kilgour, 2012). In 2013 James Cook University plans to introduce another four year undergraduate medical imaging course (Steffens et al., 2012). From Table 1 it can be seen that of the nine degrees awarded by the various institutions only two carry the same name. Furthermore, the timeframes associated with the evolution of radiographic qualifications from certificate to degree are such that there are radiographers working in Australia whose radiographic qualification is a certificate and whose training was hospital rather than university based.

Clearly there are various levels of qualification and names for those qualifications that a radiographer may hold. However, one common qualification radiographers in Australia may hold is a Validated Statement of Accreditation¹⁵ (VSoA). A VSoA is issued by the AIR when a graduate from an AIR-accredited university course has completed either four years as an undergraduate, three years plus a NPDP as appropriate to the academic institution at which the course was undertaken or two years as a graduate entry student to a medical imaging/diagnostic radiography Master degree plus a NPDP (www.air.asn.au/ accessed 06.04.2013). Overseas radiographers are assessed by the Overseas Qualification Assessment Panel of the AIR and are awarded a VSoA if their overseas radiographic qualification is deemed to be equivalent to the Australian standard at the time they received their qualification (Australian Institute of Radiography, 2009). In addition to provision of a VSoA, the AIR is also responsible for accreditation of undergraduate radiography courses, standards of competency, continuing professional development of Australian radiographers (www.air.asn.au/ accessed 06.07.2010) and it is also the professional body that supports Australian radiographers.

As the professional body that supports Australian radiographers, the AIR also provides promotion, encouragement and cultivation of high standards of practice within Medical Radiation Sciences (www.air.asn.au/ accessed 28.07.2012). The AIR has also

¹⁵ From 2005 the AIR began replacing Statement of Accreditation (SoA) with VSoA. Unlike a SoA a VSoA bears an expiry date three years from the time of issue. As the timeframe for data collection for this study covered the period of change SoA was used in this study as the requirement to recognise the healthcare professionals who undertake diagnostic radiography.

produced two documents to provide guidance for radiographers namely ‘Code of Ethics’ (Australian Institute of Radiography, 2002) and ‘Guidelines for professional conduct for Radiographers, Radiation Therapists and Sonographers’ (Australian Institute of Radiography, 2007). The AIR Code of Ethics provides four value statements along with explanatory statements that the intention of the AIR is to ‘...promote exemplary professional standards of practice, conduct and performance’ (Australian Institute of Radiography, 2002, p. 1). Codes of ethics provide the profession with a framework ‘...to direct, coordinate and assist...’ the radiographer within a changing healthcare environment (Obergefell, 1995, p. 22). The professional conduct Guidelines contain separate guidelines for each of these Medical Radiation Science practitioners presented as a Code of Practice for each and again with explanatory guidance notes. The AIR has issued the guidelines with the intention of guiding practitioners within the practice of their profession with the proviso that, as not all standards apply in all circumstances, discretion is permissible (Australian Institute of Radiography, 2007). A point to note is that at the time of data collection for this study, it was a requirement for employment as a radiographer in Australia to have a Statement of Accreditation from the AIR, although membership of the AIR was not itself mandatory (Lewis et al., 2008). The current requirement for radiographers to work in Australia, which came into effect in July 2012, is National Registration.

National registration and accreditation of the first group of ten health professions in Australia came into effect on 1 July 2010 (Australian Health Practitioner Regulation Agency (AHPRA), 2010). The organisation responsible for this registration and accreditation across Australia is the Australian Health Practitioner Regulation Agency (AHPRA). AHPRA’s operations are controlled by the *Health Practitioner Regulation National Law Act 2009* which received Royal Assent on 3 November 2009 (Forsyth, 2009). This law means that for the first time in Australia there is national registration of health professions. This shift from state regulation and accreditation to a national scheme followed from an inter-governmental agreement for the National Registration and Accreditation Scheme for Health Professionals signed by the Council of Australian Governments (COAG) in March 2008 (Bolton, 2009). Radiographers were not included

in the initial group of ten for national registration with Medical Radiation Practitioners¹⁶ not joining the scheme until 1 July 2012 (Australian Health Practitioner Regulation Agency (AHPRA), 2010).

The multiplicity of both radiographic qualifications and names that may be used to refer to the healthcare professionals for whom diagnostic radiography forms the core of their profession has the potential to cause confusion. In order to avoid such confusion it was necessary to adopt one term to refer to the healthcare professionals at the centre of this study. Since 1923 the healthcare professionals who produce radiographic images have been referred to as radiographers (Price, 2001). Furthermore, the results of a survey which included a proposal for a change of name for Australian radiographers revealed a 'split consensus' (Egan, 1993, p.51). Although approximately 50% of the Australian radiographers surveyed were content with the title 'radiographer', the other 50% felt a name change was appropriate but there was no consensus on what that name should be. The term 'radiographer' will be employed throughout this thesis to denote those people who perform diagnostic radiography: while diagnostic radiography is more than radiographic image acquisition, it also incorporates a humanistic dimension with legal and ethical responsibilities.

Outlining the reasoning behind the choice of the term 'radiographer' has offered some clarity for terminology but it has not revealed the complex, dynamic and multidimensional role of the diagnostic radiographer whose legal and ethical responsibilities extend well beyond those of an image acquisition technician. The AIR describes a radiographer as a 'key member of the healthcare team' who is responsible for producing the medical images that assist medical specialists and who needs to demonstrate '...a genuine interest in the patient's welfare' (Australian Institute of Radiography, 2009). The Australian Bureau of Statistics (ABS) defines a Medical Diagnostic Radiographer as one who 'performs medical imaging on patients according to referral from medical practitioners, calculates details of procedures... explains procedures to patients, positions patients and equipment... produces electronic or medical images... for use by medical practitioners in the diagnosis of injury or disease' (Australian Bureau of Statistics, 1997, p.173). The complex nature of radiography

¹⁶ Medical Radiation Professionals is the collective name used by AHPRA for diagnostic radiographers, radiation therapists and nuclear medicine technologists.

makes it difficult to provide a succinct definition of a radiographer which has resulted in oversimplified descriptions of both the profession and the work that they perform.

While the definitions presented above go some way to defining a radiographer, they still fall short of clarifying the role and responsibilities of a radiographer. These are discussed in the next section.

The evolution of radiography as support for medical diagnostics

The way in which radiography has evolved is central to the role's complexity. The evolution of radiography is important to this thesis because it is radiography's position within the field of medicine that has worked to marginalise the specialisation and reduce the power of the radiographer's voice. This is due to radiography having been seen as a technological process used by doctors in order to arrive at a diagnosis. The history of radiography is intrinsically linked with the history of radiology and it is not possible to understand an entity such as rural radiography without first understanding the historical processes by which it was produced (Berger and Luckman, 1966).

A strict observance of history may point to the year 1600 when Gilbert published '*de Magnete*' with his work in magnetism as the origins of radiography as it was on this publication that others based their work on electricity which ultimately led to the production of the radiographic image. However Röntgen's¹⁷ discovery of X-rays in 1895 is generally accepted as the foundation upon which radiography has been built (Campeau, 1999) and so this will be the starting point for the next section.

November the eighth, 1895, will ever be memorable in the history of Science. On that day a light which, so far as human observation goes, never was on land or sea, was first observed. The observer, Prof. Wilhelm Roentgen...Strangest of all, while flesh was very transparent, bones were fairly opaque. And so the discoverer, interposing his hand between the source of the rays and his bit of luminescent cardboard, saw the bones of his living hand projected in silhouette upon the screen. The great discovery was made.

Sylvanus P. Thompson, President of the British Roentgen Society Friday November 5th 1897 at St. Martin's Town Hall in London. (Glasser, 1995, p. 1033-1034).

¹⁷ Throughout this thesis Röntgen is the chosen spelling to denote Professor Wilhelm Röntgen rather than the also accepted Roentgen except when the inclusion of a quotation or name of a society requires otherwise.

Although the 19th century saw several notable scientific discoveries that had a significant impact within the field of medicine, this quotation by Sylvanus Thompson demonstrates the wonder in which the discovery of X-rays was held. Professor Wilhelm Conrad Röntgen is credited with the discovery of X-rays on 8 November 1895 (Watson and Sons, 1946; Glasser, 1995; Ryan et al., 1996; Golan, 2004). There is, however, evidence to suggest that many experimenters produced X-rays prior to Röntgen (Ryan et al., 1996) as the phenomenon that results from passing electrical current through a Crookes tube had been studied throughout Europe, America and Australia (Watson and Sons, 1946; Ryan et al., 1996). Indeed on 22 February 1890, Arthur Willis Goodspeed of the University of Pennsylvania, in demonstrating the use of a Crookes¹⁸ tube as a light source for photography, produced a photographic plate with the impression of two coins that had sat on top of the plates adjacent to the tube. Goodspeed did not realise the significance of this until Röntgen's announcement, when he '... then realised what an astounding discovery he had not made' (Ryan et al., 1996, p. xv). There are several other stories that appear in the literature detailing experimentation with the Crookes tube. Like Goodspeed, these early experimenters also failed to identify the medical possibilities of what have become known as X-rays. In South Australia for example, William Henry Bragg, the Chair of Mathematics at the University of Adelaide, in 1896 also experimented with X-rays but did not explore their medical application (Ryan et al., 1996). Even Röntgen's discovery of X-rays was serendipitous to the intent of his research (Campeau, 1999).

It appears that the prophetic words attributed to Roger Bacon (1214-1294)—'there are many dense bodies which altogether interfere with the visual and other senses of man, so that the rays cannot pass with such energy as to produce an effect on the human sense and yet nevertheless rays really do pass through without our being aware of it'—(Bacon, cited in Ryan et al., 1996, p. 3) hold the answer as to why X-rays initially remained undiscovered. X-rays themselves are invisible to the naked eye: the key to the emergence of the field of radiography was the identification of a means to capture the manifestation of X-rays on the human body. It was Röntgen who first described the fluorescence of barium platinocyanide paper in the presence of an activated Crookes

¹⁸ Sir William Crookes (1832-1919) was a UK physicist whose name is given to a pear shaped glass vacuum tube that contains two metal plates, one at each end of the tube, a negatively charged cathode and a positively charged anode (Ryan et al., 1996).

tube that had been shielded from light (Glasser, 1995, Ryan et al., 1996, p. xiv), so it was Röntgen who first presented X-rays to the world. Röntgen chose to denote the new rays *X-strahlen*, which translates to X-rays after the algebraic unknown, X (Goodman, 1995) with a capital X chosen for brevity (Kron, 1996). The worldwide enthusiasm (Chavda and Pahor, 1996) that followed Röntgen's discovery can be attributed to Röntgen not only recognising the phenomenon of X-rays and not considering it to be merely an experimental aberration (Wallace, 1993), but that he was also immediately aware that his discovery had medical implications (Larkin, 1978).

Röntgen created the first medical radiographic image in history on December 1895¹⁹ when he produced an image of his wife Bertha's hand (Goodman, 1995; Ryan et al., 1996). Röntgen submitted the results of his experimentation as a paper "Über eine Neue Art von Strahlen" to the Proceedings of Physical-Medical Science on 28 December 1895 and on 1 January 1896 provided several of his friends with reprints of the article (Goodman, 1995). News of Röntgen's discovery spread rapidly and on 5 January 1896 his discovery became front page news in Vienna (Goodman, 1995). The first reports of the discovery appeared in the London press on 7 January 1896 (Hamersley, 1980, p. 41) and, despite Australia's geographic isolation and the limited means of communication available in 1896, news reached the Australian press on 31 January 1896 (Hamersley, 1980, p. 42). Röntgen did not seek to patent his method of producing X-rays, a move which had wide reaching consequences for both the development and pricing of X-ray technology around the world (Ryan et al., 1996). Röntgen's decision not to patent his discovery resulted in not only the rapid employment of X-ray technologies worldwide (Kron, 1996), but also impacted upon the way in which X-ray technology in ensuing years was located within and dictated by the medical profession. This is the focus of the following section.

Prior to Röntgen's discovery, the diagnosis of a fracture in the late 19th century was difficult, imprecise and generally required manual probing of the site of the injury to detect deformity and or crepitus (Golan, 2004). In cases where there existed no evidence of deformity or crepitus, the orthopaedic diagnosis often relied on the patient's

¹⁹ The six week delay between Röntgen's discovery of X-rays and production of the first medical radiographic image has been attributed to Röntgen, a precise and meticulous scientist (Goodman, 1995), virtually isolating himself in his laboratory pursuing further observations (Wallace, 1993).

account of pain and loss of mobility (Golan, 2004). X-ray technology allowed visualisation of bones and other internal structures and so the diagnostic potential for X-rays was unassailable and the benefits of its use were seized upon (Chavda and Pahor, 1996; Kron, 1996).

January 1896 is a pivotal date for radiography. Not only was this when X-rays were presented to the world, but it was also the first instance of radiographic image production being divorced from radiographic interpretation²⁰ which is necessary for diagnosis. In January 1896 Röntgen produced a radiographic image of a fractured forearm which he submitted to the *British Medical Journal* for diagnostic opinion (Wallace, 1993; Ryan et al., 1996, p. 10). The diagnostic application of the discovery of X-rays was realised from the outset and the field of radiography with its diagnostic potential should have become very powerful. But rather than heralding the discovery of X-rays and their diagnostic potential by seeking medical opinion on the radiographic image, Röntgen delegated radiography to the power of medicine.

In order to appreciate why Röntgen would seek medical opinion on the radiographic image, thus setting in motion the way in which radiography as a profession developed in relation to the profession of medicine, it is necessary to look at what constitutes a radiographic image. Viewing a radiographic image requires a shift in perception because, until the unique properties of X-rays were revealed to the world, the human body was seen as solid (Kevles, 1997). In 1896 radiographic images represented a new reality (Pasveer, 1989) and the human body was shown to be translucent (Kevles, 1997) with the three dimensional human body represented in two dimensional shadows. The imposing of a three dimensional body on a two dimensional radiographic image has implications for contemporary radiographic image interpretation²¹. A radiographic image is simply a representation of an internal image pattern, its diagnostic value being contingent upon human interpretation (Manning and Leach, 2002; Atkinson and Gregory, 2008). This is in turn dependent upon the subjective interpretation of that visualised data as to whether the observer interprets the image correctly (Martin, 2007). In the infancy of radiology and radiographic image interpretation no body of knowledge

²⁰ Radiographic interpretation is described on pages 51 and 72.

²¹ The implications for contemporary radiographic image interpretation are explored further on page 51.

existed on which to base the findings of either normal appearances or the findings of pathology within a radiographic image as there was no implicit meaning to a radiographic image (Pasveer, 1989). Pioneers in radiographic image reading and interpretation not only lacked the knowledge necessary to give meaning to the images produced, but also the language essential to communicate the findings (Golan, 2004). The diagnostic value of radiographic images and their representation of health or disease required not only a new way of seeing the human body, but also a new language with which to communicate the findings (Pasveer, 1989). The new language used to describe and classify both the normal appearances and the pathology represented in radiographic images are modes of social construction as they depend upon social action and conventions (Atkinson and Gregory, 2008). The body of knowledge upon which radiology is built was learnt by doing, by becoming accustomed to the images and learning how to decode the meaning held within the images (Pasveer, 1989). Medical knowledge, including the knowledge of radiography, is socially constructed as it is produced and reproduced through socially shared and conventional methods (Atkinson and Gregory, 2008). The pathway for the acquisition of the knowledge necessary for radiographic interpretation is revealed in the following where, in 1903, a worker within the field of radiography is reported to have written:

Without intuition or previous study the one is almost as incomprehensible as the other, but as we gaze the wealth of detail rises before our vision until finally we are able to interpret the meaning of streaks and shadows that to the untrained eye are meaningless.
(Pasveer, 1989, p. 363).

Those who produced radiographic images became the trained eye as they accumulated the knowledge necessary for radiographic interpretation. As a consequence, radiographic images were interpreted by non-radiologists for over two decades prior to radiology evolving as a separate speciality (Nuss, 2007). The medical profession's view however, was that radiographic interpretation required medical training even if that training had contained little or no radiology or even if it was undertaken prior to Röntgen's discovery (Larkin, 1978). It is significant that, in the early discussions about radiographers' interpretations of radiographic images, no evidence of incompetence is tendered but instead subordination was argued on the basis of professional authority, maintaining the Medical Acts and protection of the public

(Larkin, 1983). Radiography became subsumed within the field of medicine and this has done little to advance the power of the field of radiography and has implications for the way that contemporary radiography (particularly rural radiography) is viewed, understood and resourced. In the rural environment there is role overlap between radiographers, radiologists and doctors and this has implications for service delivery and patient care.

Image production, interpretation and communication: interprofessional role overlap

In the first years following Röntgen's discovery there was no clear boundary between radiographers, radiologists and doctors. Anyone with an interest in X-rays could produce and interpret the radiographic images. The evident diagnostic value of X-rays led to three men of very different backgrounds independently producing X-rays in Australia²² by early March 1896, (Hamersley, 1980, p. 44). Röntgen as a physicist had presented X-rays to the world, and so it was the local physicists and scientists as the resident experts to whom Australian society looked for both explanation and demonstration (Hamersley, 1980). Among those who first produced X-rays in 1896 were T.R. Lyle, a scientist (Ryan et al., 1996) at the University of Melbourne, W.D. Filmer, a Newcastle electrical engineer and Reverend James Slattery, a science master at St Stanislaus' College at Bathurst (Hamersley, 1980, p. 44)²³. Not one of these three Australian radiography pioneers was a medical practitioner.

From 1896 when 'X-ray mania' (Goodman, 1993) gripped the world, until 1925, the terms 'radiologist' and 'radiographer' were used interchangeably (Price, 2001). Not

²² The short time that elapsed between Röntgen's announcement and the production of X-rays in Australia indicates that there must have been several Crookes tubes or similar equipment in Australia in 1896 (Ryan et al., 1996, p. xv). It has been suggested that some of the Australian developments in radiology may have evolved independently and perhaps simultaneously with Röntgen's work (Hamersley, 1980, p. 44).

²³ Exactly who produced the first radiographic image in Australia is unclear. The first radiographic image acquired in Australia may well have been produced by Reverend James Slattery in New South Wales but an exact date is not documented (Hamersley, 1980). In mid-February 1896, Walter Drowley Filmer produced a radiographic image to locate a broken needle in a foot at Newcastle Hospital (Ryan et al., 1996); this is claimed to be the first official radiographic image taken in an Australian hospital although this is not supported by documentation. The first documented radiographic image to be produced in Australia was by Thomas Ranken Lyle who published in the Argus on 4 March 1896 a radiographic image of the foot of Professor Orme Masson taken on 3 March of that same year (Ryan et al., 1996, p. 25).

only were the terms interchanged, but in some cases so were the responsibilities. As the field of radiology evolved, some hospitals employed unsupervised radiographers to both take and comment on radiographs (Larkin, 1983). Early non-medical X-ray workers were responsible for not only patient care, operation of the X-ray equipment and production of radiographs but also for reporting of the radiographs (Price and Paterson, 1996). This situation arose because the development of X-ray equipment was in the hands of physicists and electrical engineers, who in turn produced radiographs and, in the early years, ‘commonly interpreted their radiographs for the medical profession’ (Willis, 1994, p. 87). Even into the early decades of the 20th century there existed more than just terminological confusion with regard to radiographer and radiologist. In 1923 the Society of Radiographers²⁴ produced a pamphlet that was reported in *The Lancet* which read:

In order to put an end to the confusion with regards to the terms ‘radiographer’ and ‘radiologist’ it has now been generally agreed that the term ‘radiologist’ shall be applied to members of the medical profession who undertake radiographic diagnosis and treatment by means of xrays and radium, while the term radiographer be applied to their trained non-medical assistants.
(Price, 2001, p. 108)

The debate over radiographer reporting continued within the Society of Radiographers with motions banning radiographer reporting being considered and rejected by either the medical or non-medical members of the society (Price, 2001). This ambiguity over responsibility for radiographic interpretation and reporting came to an end in 1925 (Price, 2001) in the United Kingdom with medical practitioners claiming the term ‘radiologist’ and along with it the rights to radiographic interpretation.

The history of radiography briefly outlined above demonstrates that traditional boundaries now separate the professional groups of radiographer and radiologist. The English model of healthcare was transplanted into Australia with the consequence that a hierarchy of health workers already existed prior to the discovery of X-rays in 1895 (Willis, 1989). The hierarchical nature of medicine is often explained as the result of different amounts of medical knowledge and control over technology held by the

²⁴ The Society and College of Radiographers is a trade union and professional body that represents the UK radiographic workforce (www.sor.org.au accessed 12.11.2011)

different occupations that fall within the hierarchy (Willis et al., 2005). The result of these factors was that medicine was well placed to control newly emergent fields (Larkin, 1983). The role of the radiographer was made clear in 1925: radiographers produce radiographs and so a new branch within the medical hierarchy emerged (Walton, 2006) and radiology and radiography fell into an existing framework. The implications of this timeframe are not just that the hierarchy preceded radiography, but also that radiography evolved within the timeframe of the biomedical model with the dominant structural position of medicine over radiography maintained through statutory registration legislation (Willis, 1989). Clearly, history has shaped radiography and it is the evolution of radiography and radiology that has produced the current contemporary landscape in which the radiographic profession operates and by which its professional image has been shaped.

Contemporary radiographic practice cannot be understood without also understanding the role of the radiologist. Radiologists in Australia are graduates of a medical school that is recognised by the Medical Board of Australia and who have completed the Fellow of the Royal Australian and New Zealand College of Radiologists (FRANZCR) exams and five years vocational training in a Royal Australian and New Zealand College of Radiologists (RANZCR) accredited training position (RANZCR, 2009). The ABS definition of a radiologist is one who ‘examines internal structures and functions of organ systems using X-rays...correlates X-ray findings with other examinations and tests, interprets images to make diagnoses, writes reports to accompany photographic records for use by other medical practitioners...’ (Australian Bureau of Statistics, 1997, p.158).

The current model of practice for radiologists involves the provision of a high volume radiology service which typically confines radiologists to their reporting rooms (Doss, 2007), reading and then reporting radiographic images that have been produced by a *radiographer* (Reed, 2002; Thomas, 2005). The reading of a radiographic image comprises radiographic perception which is detection of all abnormalities represented on that image and then a decision is made as to what the abnormalities represent; it is this second step that constitutes the interpretation which enables diagnosis (Pitman, 2006). Correct interpretation of a radiographic image is a foundational element of radiology

(Brealey, 2001) because '[d]etecting abnormalities is a Radiologist's most important task' (Hare, 2007, p. 38).

The typical work pattern for radiologists is that they review radiographs and then dictate a report with no direct communication with either the patient or the referring clinician (Laing, 2003; Jones and Crock, 2009). Both history and Medicare have played a role in the separation of the radiologist from the patient thus leaving the patient in the care of the radiographer. The implications of the separation of the radiologist from the referring clinician and the patient are discussed in the literature review, findings and the discussion chapters.

The initial clinical examination of the patient, from which a clinical physical diagnosis may be drawn, based on the patient's signs and symptoms, is undertaken by the referring medical practitioner. It is from this clinical examination that the referrer provides the clinical data on the request form²⁵. The very reason that it has been suggested that only radiologists can offer a medical report on a radiographic image, is that image interpretation requires placing the radiological findings within the clinical context which is provided by the clinical data (Donovan and Manning, 2006; Kenny and Andrews, 2007). Clinical data provided by the referring clinician may be considered adjunctive as it is sometimes helpful and sometimes non-existent (Hare, 2007). Furthermore, it is the provision of poor clinical information by a referring clinician that can negatively impact on the quality of the radiologist's report (Summerton, 2011). In their article describing teleradiology, Kenny and Lau (2008, p. 197) reveal that '[r]eporting radiologists may have little or no clinical or contextual patient information or direct communication with the clinician caring for the patient, resulting in image interpretation occurring in isolation, rather than provision of an integrated expert opinion'. This means that often it is the radiographer who has had direct contact with the patient who may hold important clinical and contextual information pertinent to patient care. Access to the patient and the possession of clinical information on that patient improves radiographic interpretation (Queensland Government, 2011).

²⁵ The request for a radiological examination is generally based on a written document that is simply referred to as a request (Fischer, 1972) or request form (Summerton, 2011).

It is critical to note that radiographic images are to a degree illusory, and so accurate interpretation leading to diagnosis is dependent upon factors such as the skill of the reader and contextual information about the patient each of which appears to play an important role in radiographers' behaviour which is further explored in chapter 5. The diagnostic value of a radiographic image is dependent upon human interpretation (Manning and Leach, 2002). The reader of the image must reconstruct the three dimensional space of that image from the two dimensional image that is comprised of superimposed anatomical structures (Manning and Leach, 2002) where the nature of a construction of a radiographic interpretation is dependent upon conventions of representation and interpretation (Atkinson and Gregory, 2008). Radiographic image reading involves complex decision making because the relationship between the image and underlying tissues being examined may not be veridical: a radiographic image is only a representation of the organs and tissue under examination—they cannot be examined directly (Christensen, 2005).

While radiographic image reading requires mental three dimensional reconstruction of the two dimensional radiographic image, the image reading process is further complicated because the radiographic image also contains a great deal of information, only part of which is diagnostically relevant (Stender et al., 1989). The uncertainty associated with film reading means that the decision making is subject to errors and biases. The errors that may occur in radiographic film reading can be described as false negatives²⁶ and false positives²⁷. False negatives may also be referred to as perceptual errors. Perceptual error has multifactorial causes and is poorly understood (Pitman, 2006). However, it is known that perceptual errors occur because the mechanisms employed for perception by humans are prone to imperfection (Renfrew et al., 1992; Pitman, 2006). Radiographic image reading is therefore subject to the

²⁶ False negatives in film reading are of two types; the first type is an abnormality that is not detected on the initial reading of the radiographic image but is identified in a retrospective examination of the radiographic image (Hare, 2007). The second type of false negative is an abnormality that is detected but has been thought to be insignificant (Hare, 2007).

²⁷ False positives in radiographic film reading are also of two types. The first type is where an abnormality is identified that is later proven not to be present and the second is where an abnormality is detected and it is misinterpreted as being of clinical significance (Hare, 2007). The misinterpretation of normal variants falls into the second type of false positives. Examples of normal variants include accessory ossicles that may be present and may resemble a fracture. Accessory ossicles may be found adjacent to the talus, cuboid and navicular bones of the foot (Eyres & Thomas, 2005). There are text books totally devoted to describing normal radiographic variants such as the tome by T.E. Keats called *Atlas of Normal Roentgen Variants that May Simulate Disease*.

‘...psychophysiological factors of human visual perception’ making the occurrence of some instances of perceptual error inevitable (Pitman, 2006, p. 207). The findings of this study indicate that while radiographic image reading may be subject to perceptual error, radiographers are making decisions based on their assessment of not only the likelihood of perceptual error occurring, but also upon the diagnostic impact of this error on patients²⁸.

Along with the errors that may occur in radiographic film reading, there are also several forms of bias that may affect the analytical process of assessment of a radiographic image for an abnormality (Hare, 2007; Jones and Crock, 2009). Bias in image interpretation may be introduced in a number of ways:

- the clinical information available at the time of the examination,
- preferential support for a preliminary diagnosis for a particular patient as the basis for the subsequent diagnosis undervaluing information that may support a different diagnosis,
- an abnormal appearance being attributed to a diagnosis given in a previous case as it has the same appearance on the radiographic image,
- and the detection of one abnormality resulting in the failure to detect another abnormality within the same radiographic image (Hare, 2007; Jones and Crock, 2009).

While it is the radiologist who is ultimately responsible for image interpretation, it is not just the radiologist but also anyone, including radiographers, who attempts radiographic interpretation, who may find themselves susceptible to the errors and biases associated with radiographic image reading. The implications for this are discussed in chapter 2 and also the discussion and findings chapters.

Although an element of error or bias in radiographic image reading is unavoidable, it has been proposed that the error in film reading may be reduced by collaboration (Christensen, 2005). The methods of reimbursement of diagnostic imaging services such as the Medicare rebate do not make it financially viable for collaborative or double reading of radiographs (Pitman, 2006). Double reading, as it is traditionally interpreted, involves two radiologists independently viewing one

²⁸ Diagnostic impact on patients is discussed in chapter 2, page 77 and chapter 5, page 195.

radiographic examination (Pitman, 2006). Double reading as a form of quality assurance can significantly reduce the incidence of error (Freckelton, 2012). Contemporary radiologic practice however does not incorporate double reading: with the exception of Breastscreen mammography, Australian diagnostic radiology practice involves single reading of all radiographs (Pitman, 2006). The practice of single reading has developed historically and is in line with international medical community practice (Pitman, 2006). Single reading involves viewing of the radiographic image by one radiologist who is then charged with all the responsibility for perception and interpretation of the radiographic image and communication of that radiographic interpretation (Pitman, 2006).

Communicating the results of radiographic interpretation

While image perception and image interpretation are crucial components of the radiology information chain, the next critical component of radiology is communication of that interpretation. It is a report that provides a means to communicate the results of a radiological examination (Thomas, 2005). The reason that the report traditionally produced by a radiologist is so important is that it is used by a referring clinician as part of their clinical decision making process. The report is used by the referring clinician to either alter or confirm a patient's management because the first step in treatment is diagnosis (Thomas, 2005). In some instances, radiology is essential for identification of disease (Dixon, 2006) or pathology. In some cases the detection of an abnormality on a radiographic image constitutes the diagnosis (Hare, 2007) as in the case of detection of a fracture. Diagnosis is pivotal to treatment decisions for any health concern because clinical management hinges on diagnosis (Yielder, 2006; Ng and Palmer, 2007), which in turn is reliant upon accurate radiographic interpretation and reporting.

A report can have several forms: one basic differentiation between report types is verbal and written. Direct discussion with a referring clinician either face to face or by telephone is an example of a verbal report (Thomas, 2005). Discussions with an intermediary, such as a nurse accompanying a patient, with the intention that that message is passed on to the referring clinician, may also be considered a verbal report (Thomas, 2005). A red dot placed on a patient's film packet or a star on a digital image (Saunders, 2012) to alert a referring clinician that the radiographic images demonstrate a

radiographic abnormality, may also be considered a report. A definitive written report however appears as a paper based copy on a standard format or as text on a computer screen (Thomas, 2005). It is the written definitive report that has come to be considered by the community as factual rather than the result of a radiologist's subjective opinion (Hare, 2007). The implication for the radiological report as an opinion means that it is not beyond debate (Robinson, 1997). Professor Nigel Thomas when writing the chapter entitled 'A Radiologist's Perspective', points out that statements such as 'no fracture seen' and 'no acute fracture seen' are part of a bank of statements that may be used in radiographic image reporting (Thomas, 2005, p. 17). The implication is clear: such statements do not say that definitively there is no fracture but rather that the viewer has not identified a fracture within the radiographs. A written report is produced when a radiologist dictates the report into a dictaphone or digital recorder. The dictated report may be transcribed by a medical typist or by the use of voice recognition software which may allow the report to be transcribed as the radiologist speaks. No matter the method of transcription or whether the report is transmitted to the referring clinician electronically or by post, considerable time lags can be experienced between reporting and report delivery. The consequences of this delayed reporting are further discussed in the literature review, findings and discussion chapters.

The delayed, retrospective report provided by radiologists as a written report, may be referred to as cold reporting. Antonymic to cold is of course hot. While *cold* reporting may take place sometime after the patient's attendance, *hot* reporting allows for provision of a radiographic report at the time of the patient's attendance. The benefit of hot reporting is that it provides an opportunity to revolutionise patient care with hot reporting directly to sub-specialty clinics or to primary care physicians (Doss, 2007). A hot reporting service has the potential to inform both patient treatment and management within the timeframe of their attendance at the emergency department (Hardy et al., 2008). At the time of this study the status in Australia is that no matter whether the report is provided as cold or hot reporting, the important aspect of a written definitive report is that it has been verified by a radiologist, thus making it legally binding (Hare, 2007).

Along with being legally binding in Australia, a radiologist's report is a necessary requirement under Medicare. Medicare provides financial support for

Australians to access medical care which includes medical imaging. Medical benefits are not payable if medical imaging is provided by a self-employed radiographer (Australian Government. Department of Health and Ageing, 2011). Medical benefits are only payable where a radiographer provides the service as an employee or under the supervision of a radiologist who is then required to provide a report (Australian Government. Department of Health and Ageing, 2011). At first glance, radiographic interpretation looks straightforward, because the inference that might be drawn from the requirement of a radiologist's report and the supervision of the radiographer under Medicare, is that radiographers and radiologists must always work in tandem although not necessarily collaboratively. Despite this, radiographers often operate independently of a radiologist's supervision in after-hours situations (Smith and Lewis, 2003). Furthermore, radiographers in rural and remote areas are often working in the absence of a radiologist not only in out of hours situations but also during usual working hours (Smith et al., 2009b). Therefore, in rural practice the boundaries are blurred as the responsibility for interpretation falls to the radiographer. The complexities of rural practice impact on radiographers' interpretation and the potential for legal and ethical dilemmas increases significantly.

Legal and ethical challenges of rural radiographic practice

The previous section has demonstrated that not only has history shaped contemporary radiography, but it has also resulted in apparent demarcation between radiographers and radiologists. The complexities of working within the rural environment have resulted in role ambiguity because this demarcation is not so well defined. Diagnostic radiology consists of two fundamental steps that form what are essentially the two halves of the imaging process: image acquisition and image reading (Pitman, 2006). The radiographer is typically seen as responsible for *image acquisition* and the radiologist for *image reading* (Pitman, 2006). The boundaries appear well defined with radiographers operating within an environment dominated by a medical hierarchy, using 'stylised postures' (Egan and Baird, 2003, p. 13) and positioning of patients, coupled with technical factors in their goal of image acquisition. It is the image acquisition component of radiography that can be seen to explain the perception of radiographers as 'button pushers', as technicians who require simple manual and cognitive skills. However radiographers operate within the dichotomous role of technician and carer

(Dowd, 1992). It is the dichotomous role of the radiographer that is explored in the following section.

Image acquisition is achieved by radiographers employing imaging protocols. The imaging protocols employed by radiographers are comprised of both patient positioning and technical factors. Radiographers utilise radiographic positioning to demonstrate specific body parts on to an imaging receptor (Murphy et al., 2005a). Radiographic patient positioning is therefore fundamental to radiography. Mindful that a medical radiographic image is a two dimensional representation (Murphy et al., 2005b) of a three dimensional being, the radiographic examination by necessity constitutes at least two radiographs of the anatomy in question at projections at ninety degrees to each other. Radiographic positioning has evolved in order to place a patient in the appropriate position to afford the best possible view of the anatomy in question within the limitations of human kinetics.

Viewing the work environment of a radiographer from the outside, it may appear that the work is essentially technical (Sonnex et al., 2001) as the only tasks obviously discernible are physical adjustments to patient positioning and manipulation of the apparently highly technical exposure factors at the control panel. The technical factors that comprise the second component to imaging protocols employed by radiographers are achieved through manipulation of the electrical supply to the X-ray tube²⁹ and are referred to as exposure factors. The exposure factors selected by a radiographer for each particular radiographic examination are determined by several variables, namely the density, atomic number and thickness of the anatomic part, the image reception method employed and any pathology thought to be present (Murphy et al., 2005b). The exposure factors are a combination of kilovolts (kV), milliamperes (mA) and time which is a measure of the duration of the exposure and is expressed as milliseconds (ms). Each of these exposure factors has a particular effect on the quality of the radiographic image (Murphy et al., 2005b) which must be taken into consideration prior to each radiographic examination and are adjusted by the radiographer at the control panel.

²⁹ The X-ray tube is described in Appendix B.

The imaging protocols of patient positioning and technical factors are employed by radiographers in order to produce a radiographic image. The methods of acquiring and storing of the radiographic images have evolved throughout the history of radiography (Murphy et al., 2005b) and have moved some way since Röntgen's barium platinocyanide paper (Glasser, 1995; Ryan et al., 1996, p. xiv). Traditionally, the image resulting from a patient's exposure to X-rays was displayed on photographic films which may be referred to as a hard copy³⁰ (Murphy et al., 2005b, p. 42). The conventional film-screen technology that requires chemical processing is being replaced by digital technologies (Murphy et al., 2005b). The resultant digital images are often displayed on a computer screen and may be referred to as a 'soft copy' (Murphy et al., 2005b, p. 50) or they may be printed onto film to produce hard copy radiographic images. This move from film based to digital acquisition has seen the introduction of Picture Archiving and Communication Systems (PACS) (Murphy et al., 2005b). PACS is used for the electronic storage, retrieval and display of radiographic images and has replaced the equipment associated with film based technology such as viewing boxes, film cassettes, processors and film libraries with computer technology (Larsson et al., 2007). PACS workstations may be located throughout a Medical Imaging Department or outside the department such as at various locations throughout a hospital (Bryan et al., 1999) or even geographically separate from the hospital. The introduction of PACS and the consequent filmless radiology has resulted in dramatic changes in radiographers' work practices (Larsson et al., 2007). The evolution of radiographic technologies has impacted not only upon contemporary radiography, but also further separated the radiographer and the radiologist.

Radiographers care for a patient by striving to produce an optimum radiographic image. An optimum radiographic image demonstrates maximum detail by utilising correct exposure factors with perfect patient positioning (McQuillen-Martensen, 1996). Patient care may be adversely affected by a less than optimal radiographic image. Patient care is therefore integral to the radiographic profession (Lam et al., 2004). Patient care in radiography is generally understood as patient care that is limited to the duration of the radiographic examination (Smith and Lewis, 2002; Lam et al., 2004).

³⁰ This image which is composed of deposits of silver on a polyester base is permanent and unalterable (Murphy et al., 2005b).

However, the patient-radiographer interaction is a challenging area of practice for radiographers (Bowman, 1993, Blieker et al., 2011).

Radiographic examinations expose patients to relatively small doses of ionising radiation³¹. In order to provide protection, radiation exposure times are kept to a minimum and only essential personnel remain in the room during radiological examination with these people protected by protective aprons or shield (Murphy et al., 2005b). Additionally the X-ray beam is not only filtered but also collimated so that only the only the area of interest on the patient is exposed to X-rays (Murphy et al., 2005b). In aiming to produce an optimum radiographic image and so maximise patient care, radiographers utilise a range of techniques to keep radiation dose to a minimum. These techniques include minimisation of repeat radiographic images, gonad shielding, appropriate collimation, correct selection of projections and exposure factors (MacKay et al., 2012). Poorly exposed radiographic images or those demonstrating inadequate patient anatomy result in a less than optimum radiographic image and radiographers are aware that radiographic interpretation is hindered by a radiographically suboptimal image. A radiologist cannot report what cannot be seen (Thomas, 2005). Indeed nobody is in a position to make an informed comment on a radiographic image on something that is not clearly demonstrated. For radiographers the quality of the radiographic image is a reflection of their professional care (Smith, 2007). Patient care for radiographers extends beyond the boundaries of image acquisition but this has failed to be recognised by those outside the profession (Smith and Lewis, 2002; Lam et al., 2004; Smith et al., 2009a).

Impacting on the underestimation of the role of the rural radiographer is the underestimation of the influence that rurality has on work practices of the rural healthcare workforce. The following provides a brief exploration of the health workforce in rural Australia and provides context to the particular conditions that shape rural radiographic practice. Rural and remote areas constitute a considerable part of the total Australian land mass. For example 80% of the state of New South Wales is considered to be rural or remote but this area only has 5% of the state's population (Allan et al, 2007). A result of reduced population is a negative correlation between

³¹ See Appendix C for information on detrimental sequelae of exposure to ionising radiation

increasing remoteness and the availability of health services in rural Australia (Smith et al, 2008a). The vast distances that may exist between rural communities mean that residents of rural communities are often required to travel to their nearest health facility or that health professional operate outreach programs that require them to travel to geographical locations remote from their principal place of employment (Smith et al 2008a). Indeed it has been reported that 56% of Australian rural allied health professionals participate in outreach services (Struber, 2004). Not only may allied health professionals only be available in some communities in a sessional or part time basis (Smith et al, 2008a) but 36% of rural allied health professionals are sole practitioners (Struber, 2004). Rural healthcare workers, therefore would be best defined as rural by their role and the work that they undertake rather than their geographical position (Hays, 1999). In non-metropolitan Australia, innovative healthcare models have evolved in order to meet local healthcare needs within the rural and remote context (Bourke and Sheridan, 2008; Humphreys et al., 2008). Whereas urban practice and the traditional hierarchical model of hospitals and universities produce health professionals predisposed to an authoritarian or even autocratic outlook, this sentiment is contrasted by the more egalitarian nature of rural practice where teamwork is the mode of operation (Wakerman and Lenthall, 2002). Rural and remote healthcare professionals work in an environment where ‘...professional boundaries tend to be less rigid and scopes of practice broader’ (Productivity Commission 2005, p.208) resulting in rural health practice being described as multidisciplinary with practitioners working in extended roles (Wakerman and Lenthall, 2002; Productivity Commission, 2005; Smith et al 2009c). The multidisciplinary nature of rural healthcare is driven by necessity, sometimes urgency and the often limited range of healthcare professionals available in rural and remote areas (Productivity Commission, 2005). The professional isolation experienced by rural and remote GPs for example has resulted in them relying on allied health professionals to provide them with professional support (Allan et al, 2007). The consequence of this reliance is that allied health professionals provide not only an important part of the health care network (Smith et al, 2008a) and but contribute to the sustainability of rural health services (Struber, 2004). It has been suggested that the complexity of the work that they are required to perform means that rural allied health professionals are required to be ‘specialist generalists’ (Struber, 2004, p. 3). However health practitioners are often insufficiently prepared for rural and remote practice (Blue, 2002; Wakerman and Lenthall, 2002; Struber, 2004). O’Regan (1991) believes that

working in the bush, as he calls it, requires jumping in the deep end and either sinking or swimming. So while the principle of teamwork in rural areas is supported by several authors (Goldin, 1979; Best, 2000; O'Connor, 2000; Hays, 2002; Gibson, 2004; McBrien, 2005; Smith et al, 2009c; Mills et al., 2010), a complication of working in rural areas is that few healthcare professionals come with the knowledge necessary to establish or participate in collaborative practice (Norsen et al., 1995; Struber, 2004).

A model that was suggested along with collaborative practice for workforce reform is realignment of existing workforce roles (Productivity Commission, 2005) which is expansion of traditional scopes of practice. This concept of role redesign has had positive outcomes in terms of decreased waiting times, increased patient care, increased job satisfaction and the creation of more attractive jobs (Productivity Commission, 2005). Allied health professionals adopting an expanded scope of practice can contribute to ease and speed of access to specialist services and, particularly in radiology, with improved patient outcomes (McPherson et al., 2004). Two of the many positive aspects of healthcare in rural and remote Australia are that they are 'incubators' for the development and testing of models of expanded scope of practice and that these innovations potentially will provide the base for system-wide change (Productivity Commission, 2005). Many rural practitioners are employing expanded scope of practice because they already operate within broader scopes of practice. Radiographers acquire knowledge of the culture and work practices of radiography through working in the medical imaging department (Allbutt, 2011). It is within the environment of the viewing room or tea room that the more experienced radiographers will relate tales of previous modes of practice and past experiences (Decker and Iphofen, 2005). Rural radiographic knowledge and practice are therefore not static (Baird, 2008) but rather they are constructed through social interaction: knowledge is interactive, historical, situational and contextual (Koro-Ljungberg, 2008). Therefore it may not be necessary to develop models of expanded scope of practice as outlined, as they may already exist in rural areas.

Although rural healthcare professionals may already be operating within expanded scopes of practice, the nature of the expansion may not be recognised as there are numerous examples where small scale innovations go unreported and consequently fail to be disseminated more widely (Scott, 2009). Informal procedures arising from

unreported local innovations generally emerge in response to an unusual situation but may eventually develop into an unwritten behavioural norm (Symon et al., 1996). Recognition of expanded scope of practice may be seen as formalising a healthcare professional's scope of practice to include a skill that they already possess (O'Connor, 2005; Freckelton, 2012) and are probably already practising. Informal procedures allow for the dynamic and social aspects of a given situation where difficulties may arise with the blanket application of formal procedures (Symon et al., 1996), such as a radiographer's strict adherence to a scope of practice that only incorporates image acquisition. The current delineations in roles in healthcare may impede the alignment of skill sets to clinical tasks (Scott, 2009) and this may impact on patient care. Where informal procedures are adopted but remain unreported, they may remain unrecognised and so not codified by managers (Symon et al., 1996). The adoption of informal procedures has been recognised in radiography. In 2011, the then president of the AIR, Mr Bruce Harvey referred to roles in radiography which '...have never been widely formalised and in fact have been 'allowed' while concurrently and subtly played down by senior medical hierarchy' (Allin, 2011, p. 7). But it is these very practices that are accepted as enabling the work and as culturally acceptable (Symon et al., 1996). What is needed is not necessarily testing of a model of expanded scope of practice—as the Australian Government has already funded numerous pilot health care models (Humphreys et al., 2008)—but rather to take a look at what is actually happening in rural and remote communities with regard to providing safe and appropriate health care (Kamien and Cameron, 2006, p. 653). Many healthcare workforce initiatives have occurred at a local level as a response to frontline needs and these need to be identified (Health Workforce Australia, 2011).

While rurality as a context may have shaped the working environment for the rural radiographer, it also shapes the living environment. Living in rural and remote areas 'is distinctly different from the professional and social experiences that are familiar to the majority of Australians who live in, or are in close proximity to large cities' (Lyle, 2002, p. 260). This idea is supported by O'Regan (1991) who believes that anyone who has ever worked in healthcare in rural and remote Queensland would realise that some unique and significant problems exist. These problems are not always appreciated by those who work in metropolitan Australia. For example in 2013 NBN Co Chief Executive Officer Mike Quigley proposed that the rollout of the national

broad band network (NBN) throughout Australia ‘...is key to bridging the divide between the city and the bush...For instance, faster speeds will allow people in regional communities to work from home like they would from the office, access video-based health services and make high-quality video calls to family and friends’ (www.nbnco.com.au/assets/medi-release/2013/nbn-co-arianspace-4-mar-2013.pdf accessed 08.06.2013). This idea is contradicted by Steve Love a pharmacist in rural Tasmanian who owns the first business to connect to the NBN in 2010 who stated in an interview conducted on 31 December 2012 ‘hasn’t changed anything, take a while for new technologies to develop and become mainstream’ (www.abc.net.au accessed 07.04.2013).

Work in smaller rural settings is different from urban practice but accounts by various rural health professional groups reveal common ground (Blue, 2002). In small towns patients and healthcare professionals will often share more than a healthcare professional/patient relationship. Rural healthcare professionals live in the community with their patients and as a consequence they might have known their patients for years, and might even be related. Ambiguity exists at the boundary between rural professional practice and social relationships (Glover, 2001; Fuller et al., 2002; Bourke and Sheridan, 2008) and this ambiguity has implications for decision making by rural healthcare professionals. In the rural environment these very relationships make it difficult to distinguish between personal and professional roles (Sigsby, 1991; Turner et al., 1996; Ozolins et al., 2004; Bourke and Sheridan, 2008). Rural healthcare workers function in a context of overlapping relationships that present potentially conflicting roles that may compound ethical problems (Roberts et al., 1999). In the literature detailing the rural experiences of general practitioners, nurses and some allied health professionals, friends as patients was considered an issue by several authors (Sigsby, 1991; Dwyer, 1996; Turner et al., 1996; Glover, 2001; Ozolins et al., 2004). Preparation of healthcare professionals for negotiating these blurred roles and the dilemmas that arise is limited.

Healthcare professionals moving to work in rural practice may not initially be aware of the difficulties surrounding the interwoven relationships that are a part of living and working in a rural community. In his reflections on rural medicine, Wilkinson (1999) comments on how he had not initially considered the implications of

caring for family and friends, but he believes that this is an unavoidable issue in rural practice. Experienced rural healthcare professionals appear to be aware of the lack of clarity of the juncture of their professional and personal roles within their community. In a study of women GPs in rural South Australia it was revealed that these doctors were aware of the blurring of the boundaries between patients and friends (Ozolins et al., 2004). The timeframe required for the establishment of the more extensive social networks could be considered to be quite short as it is also believed that over a two year period it would be very difficult for a healthcare professional not to become a friend, or at least a social acquaintance, to many of the residents of a small town (Fuller et al., 2002).

John Berger tells the story of John Sassall M.B., Ch.B., D. Obst. RCOG who was a general practitioner, practising medicine in an economically depressed, remote, rural community in England. When referring to Sassall's dilemmas of dealing with the sick Berger states '[w]hat makes it more acute for Sassall is his isolation, his closeness to his patients...' (Berger and Mohr, 1969, p. 141). It is not the social relationships in themselves that present the difficulties for healthcare professionals, but rather how they manifest and are managed in clinical practice. Rural healthcare practitioners may therefore encounter situations within the scope of their practice that are a cause for concern and radiographers are no exception. It is the conflict between commitment to personal values and professional responsibility that is a concept central to ethics and the dilemmas experienced (Turner et al., 1996).

The literature and debate around ethics introduce a number of overlapping terms which in addition to the words 'ethics' and 'morals' includes 'values' (Preston, 2001). Ethics can be defined as '...a system of moral principles, by which human actions and proposals may be judged good or bad, or right or wrong....the rules of conduct recognised in respect of a particular class of human actions... moral principles, as of an individual' (Moore, 2005, p. 399). It is the Greek derivation from the word *ethos* meaning 'character' or 'custom' (Preston, 2001) that captures the culturally and socially constructed nature of the word and so lends it colour. The word 'moral' is related to the English word *mores* which reflects its link to customs or habits (Preston, 2001). The value-laden nature of both ethics and morals is clear when considered in this light. The closeness of the rural relationship creates situations that involve questions of morality

and this creates the conditions in which ethical dilemmas may arise (Turner et al., 1996; Roberts et al., 1999; Cook et al., 2000; Cook et al., 2001; Glover, 2001; Warner et al., 2005).

Specific guidance through pre- and post- registration education within the ethical domain and for dealing with ethical dilemmas is limited for rural healthcare workers. Colleagues, supervisors and ethics experts are often not available to rural practitioners and if they are, they may not be cognizant of the subtleties of life in small communities (Roberts et al., 1999). Rural healthcare providers also feel that any sources of information about ethical dilemmas are so urban biased that they are unhelpful in remote communities (Roberts et al., 1999). Furthermore, the bioethical agenda is driven by what has been referred to as the 'neon' issues (Braunack-Myers, 2001, p. 1). The neon issues that Braunack-Myers (2001) refers to are high technology, beginning and end of life issues, and the allocation of resources with the result that the mundane and subtle issues that exist are largely ignored. As a consequence of this lack of guidance, some rural workers are adopting their own rules for resolution of ethical issues (Roberts et al., 1999). The remainder of this thesis focuses on ways radiographers respond to these ethical issues with regard to radiographic interpretation, communication and disclosure of their radiographic opinion.

Overview of the thesis

The thesis is presented as eight chapters. Chapter 1 has provided the background and context of the study. It examined the history of radiography and how this has shaped contemporary radiographic practice. This chapter also outlined the research problems, purpose, aims, research design, significance and questions for the study.

The following chapter presents a review of the relevant field literature presented in sections that correspond to the identified themes. The themes identified within the literature were:

- Radiologist's Reports - Delays and Absences
- Radiographic Interpretation
- Diagnostic Error in Radiographic Interpretation

- Multidisciplinary Radiographic Interpretation
- Communicating with Referring Clinicians: Limitations and Management
- Radiographer Abnormality Detection Schemes
- Disclosure to Patients: Difficulties and Ethical Implications

Chapter 3 outlines the theoretical framework underpinning the study. It provides an examination of social constructionism and the theoretical perspectives used to provide a lens for understanding radiographic interpretation, communication and disclosure of radiographic opinion by rural radiographers. Chapter 4 presents the methods and techniques used in data collection and analysis. It also provides a demographic description of the rural radiographer participants of this study and the strategies employed to ensure the trustworthiness of the findings for this study. Chapters 5 and 6 report the results and interpretations of the data collected in order to answer the research questions. The findings are presented as six key themes:

- Beyond the technical
- The diagnostic gap
- Strategies radiographers employ for responding to the diagnostic gap
- Factors that inhibit radiographers' actions to close the diagnostic gap
- Navigating the diagnostic gap with referrers
- Disclosure of radiographic opinion to patients

The first five themes are presented in chapter 5. The sixth theme, disclosure of radiographic opinion to patients, which is presented in chapter 6, is a large theme and is wholly concerned with the ways in which rural radiographers make choices around disclosure of their radiographic opinion to their patients. In these chapters each key theme is presented and described in turn along with its supporting themes and relevant sample quotations drawn from the rural radiographer narratives and with relevant data from the questionnaire.

Chapter 7 discusses the research findings and uses ethics as a theoretical lens in order to understand the strategies that rural radiographers employ to navigate through the ambiguity that surrounds radiographic interpretation and disclosure. This chapter discusses how rural radiographers appear to share a common ethical framework and

how, within this common ethical framework, radiographers in possession of their radiographic interpretation make decisions around conveying their radiographic opinion.

Chapter 8 is the final chapter and presents the conclusion to the thesis. This chapter also outlines both the strengths and limitation of this study along with recommendations for future areas of research and a concluding statement.

Summary

This chapter has provided the background and context for the study. The history of radiography has been examined and it has been demonstrated how this has shaped contemporary radiographic practice. Initiatives are being discussed to change the Australian health workforce structure without a sound understanding of current radiographic practice. Rural radiography requires a more complex knowledge and skill mix than simply ‘pushing buttons’. Rural radiography incorporates a complex humanistic dimension. Integral to rural radiography is patient care. While rural radiography requires more than technical skills, rurality clearly shapes both the working and living environment of rural healthcare practitioners. The innovative local solutions adopted by rural healthcare practitioners have evolved to ensure quality patient care within a traditional hierarchical workforce model.

In chapter 2 the focus turns to the literature in an attempt to unpack how the complex nature of radiographic practice by presenting radiographers involvement in multidisciplinary practice and expanded scope of practice. Of particular interest to this study is the ethical issues that rural radiographers encounter and how these issues shape radiographic interpretation, communication and disclosure practices.

Chapter 2: Literature Review

Introduction

The previous chapter established that rurality impacts on both the professional and social environment of rural radiographic practice. It also argued that radiographers are not present in large numbers in rural practice (Blue, 2002; National Health and Hospitals Network, 2010) and are most likely to be solo practitioners (Huntley, 1991; McBrien, 2005). Rural radiographers require an increased skill set in order to exercise independent clinical judgment and decision making (Productivity Commission, 2005) due to this geographical isolation and lack of professional support. It is this lack of professional support that has resulted in comments from rural radiographers such as '[t]here is no back up support, you are on your own' (McBrien, 2005, p. 20). The unique nature of rural radiographic practice produces ethical dilemmas that do not typically occur in metropolitan areas. The result is that the rural context has produced a field of radiography that must respond to complex humanistic, legal and ethical challenges. In this chapter the rural context is further examined to show how it impacts on radiographic practice, and specifically on radiographers' involvement in radiographic interpretation, communication and disclosure.

Literature review—method

The literature searches commenced in 2005 with a search of the appropriate databases, including CINAHL (Cumulative Index to Nursing and Allied Health Literature), Informit Health Collection, Medline via PubMed, Scopus, Web of Science and Wiley Online Library. The key search terms 'rural radiographer' and 'rural radiography' failed to provide any literature related to Australian rural radiography. A targeted manual search of the Australian radiography journal *The Radiographer*³² identified ten articles on issues pertaining to Australian rural radiography. Only one of these articles reported on ethical issues for Australian radiographers, which suggests limited research

³² In August 2004 Marilyn Baird revealed that *The Radiographer* did not appear in citation databases (Baird, 2004). While *The Radiographer* commenced as a non-peer reviewed journal it is now the peer reviewed journal of the Australian Institute of Radiography (Baird, 2004). It is also now more easily accessed as from August 2010 it became available as delayed open access with access to all issues except for the current issue through the publisher's website.

has been undertaken within this area. Indeed the scarcity of literature on ethics and radiography was also reported by Lewis (2002, p. 151) who revealed that '[u]nfortunately dedicated literature into ethics and radiography is under-represented in the professional literature despite its importance'. McConnell et al. (2012) also encountered a scarcity of articles detailing research into Australian radiographers undertaking radiographic interpretation. Another Australian radiography journal, *Spectrum*³³, was manually searched which revealed a further eleven articles for the literature review.

In light of the under-representation of appropriate literature, the search parameters were widened to include the themes already identified in the articles obtained as descriptors. The descriptors 'radiographer', 'radiography', 'interpretation', 'red dot', 'ethics' and 'bioethics' in various combinations were then used in another electronic database search.

The literature was revisited during the write up phase of the study to ensure currency. At the time of its completion in August 2012, a total of 139 papers were included in the literature review which is presented in the following sections.

- Radiologists' Reports - Delays and Absences
- Radiographic Interpretation
- Diagnostic Error in Radiographic Interpretation
- Multidisciplinary Radiographic Interpretation
- Communicating with Referring Clinicians: Limitations and Management
- Radiographer Abnormality Detection Schemes
- Disclosure to Patients: Difficulties and Ethical Implications

The literature review that follows outlines rural radiographers' involvement in radiographic interpretation, communication and disclosure. While the literature presents evidence of radiographers' high level of skill in radiographic interpretation, it reveals that rural radiographers' involvement in radiographic interpretation,

³³ *Spectrum* is also an official publication of the AIR. However it is a news vehicle by which the AIR disseminates news to its members and is not a peer reviewed journal.

communication and disclosure are poorly understood dimensions of rural radiographic practice.

Radiologists' reports - delays and absences

Medical imaging plays a significant part in diagnosis and patient management (Jones and Crock, 2009; Smith et al., 2009a; Reiner, 2010). Indeed, the aim of submitting a patient to a radiographic examination is for a referring clinician to become aware of any significant radiographic abnormality on the patient's radiographic images so that appropriate treatment can be instigated. It was established in chapter 1 that the primary mechanism for the communication of a radiographic interpretation indicating the presence of a radiographic abnormality on a radiographic image is a radiologist's report. A radiologist's report often provides critical information to assist a referring clinician in arriving at a diagnosis, which in turn may lead to the alteration or confirmation of a patient's management (Thomas, 2005; Reiner, 2010). Diagnosis is pivotal to treatment decisions for any health concern because clinical management hinges on diagnosis (Yielder, 2006; Ng and Palmer, 2007). There is widespread agreement that provisional diagnosis is achieved through a process of deduction by the referring clinician (usually a doctor) from clinical assessment of the patient which may then be confirmed or refuted on the basis of radiographic findings (Hardy and Barrett, 2003; Free and Lee, 2009). This is most clearly demonstrated when a patient is either discharged or alternatively prepared for surgery dependent upon the results of a radiological examination (Dixon, 2006).

The benefits to the patient of a timely and accurate radiographic interpretation cannot be overstated. An immediate and accurate radiographic interpretation, which is an example of hot³⁴ reporting, used to guide clinical decision making by the referring clinician, can produce a significant benefit to the patient (Sonnex et al., 2001; Reiner, 2010; McConnell et al., 2012). As already revealed, the provisional diagnosis reached by a referring clinician may be confirmed or refuted on the basis of radiographic findings (Hardy and Barrett, 2003; Free and Lee, 2009) and, in the case of examination by inexperienced doctors with limited clinical experience, the objectivity of a

³⁴ Hot reporting is described in chapter 1, page 54.

radiological examination may often prove more reliable than their subjective clinical examination (Dixon, 2006). The importance of the radiographic report for communicating the results of a radiographic examination becomes apparent when the implications of its use for informing diagnosis are made explicit. The communication of results is therefore a critical part of any radiographic examination because the communication of a significant or unsuspected radiographic abnormality can often be as important as the finding itself (Laing, 2003). The way in which radiographic images are interpreted and the findings communicated, however, is not straightforward. Complicating factors such as referral times and health workforce practices contribute to a complex practice environment and as a consequence delayed reporting may occur which has implications for patient care. Nowhere is this more apparent than in rural practice.

While a report on every radiographic image by a radiologist is ideal, many films are not reported or the reports may not be generated in time to influence the management of patients (Saxton, 1992; Rudd, 2003; Gibbon, 2005; Queensland Government, 2011). A United Kingdom Audit Commission revealed that a significant criticism of the reporting services offered by radiology providers was that reports were not provided for all examinations (Brealey and Scuffham, 2005). The absence of radiologic reports for some radiographic images is also evident in Australia. The acute on chronic health workforce shortages which mean there is a lack of radiologists to read and report on films within many hospitals, has resulted in no plain film reporting (Gibbon, 2005). For example, a 2007 newspaper article reports that a backlog of 4,500 images at Liverpool Hospital in Sydney, Australia, had not been reported (Patty, 2007). Internationally, there are attempts to improve the radiographic reporting timeframes but delays of up to 72 hours are still occurring before a report is available to an emergency department clinician (Hardy et al., 2008). As a consequence of delays in reporting, healthcare professionals are sometimes required to modify a patient's treatment in line with the findings in the report some considerable time after the patient's radiographic examination (Hardy et al., 2008). Some United Kingdom emergency departments are reporting delays of up to 28 days in receiving reports (Rudd, 2003). While delays of the magnitude reported in Rudd's United Kingdom study have not been reported in Australia, there are still significant delays in provision of a report on radiographic images to the referrer.

A study of workflow through a medical imaging department in a large Australian rural base hospital revealed a large percentage of delay times in workflow were due to radiologists being solely responsible for reporting films and images (Phillips et al., 1999). Consequently, it is now known that radiographs may be left unreported over the weekend and that this is contributing to the significant delays in availability of a radiologist's report (Phillips et al., 1999). One Australian rural radiographer revealed that in the small rural Victorian hospital where she is employed, there is approximately a 24-hour turnaround between image acquisition and provision of a report to the referring clinician (Gibson, 2004). In 2005, a radiology department in a small rural Queensland hospital had a turnaround time for hard copy films of seven to ten days (McBrien, 2005). Delays of one to three days between image acquisition and provision of a report to the referring clinician are now commonplace in both rural and metropolitan hospitals (Smith et al., 2009b). A review of Queensland Health medical imaging services revealed that in 2008/09 only 39% of all radiological reports were available within 24 hours (Queensland Government, 2011). Time delays in radiographic image reporting are unlikely to improve because of the widening of the gap between supply and demand for Australian radiological services. The likely outcome of a widening in the gap between supply and demand is increasing workloads for radiologists, which will in turn make it unrealistic for all radiographs to be reported by a radiologist in a timely manner (KPMG, 2009; Smith et al., 2009a). The time delays in radiological reporting may therefore compromise health professionals' ability to access information on radiographic images that is crucial for diagnosing patients³⁵.

The main consequence of anticipated delays in reporting (or the absence of reporting) is that the radiographic image is available prior to, or without, the radiologic report being available. In many clinical situations therefore, it is the provision of a radiographic image rather than the radiologist's report that is the essential requirement of the referring clinician (Swinburne, 1971). In the case of hard copy film this scenario unfolds by a patient carrying their unreported radiographs with them to follow-up consultations. In the case of soft copy images, the unreported radiographic images are available at Picture Archiving and Communication Systems workstations which may be located throughout a Medical Imaging Department or outside the department in such

³⁵ The potential consequences of a delay in diagnosis are discussed on page 77.

locations as Accident and Emergency Departments. Responsibility for interpreting these unreported images generally falls to the referring clinician, that is, the clinician who initially examined the patient and referred them for radiographic examination (Benger and Lyburn, 2008; Saunders, 2012). Due to the time delays in availability of radiologists' reports, a referrer may first become aware of a radiographic abnormality by self-examination of the radiographic image or by radiographer input, so that interpretation of radiographic images produced by the radiographer has moved beyond the traditional domain of the radiologist (Reed, 2002; Saunders, 2012). Although the radiographic images may ultimately be reported by a radiologist which increases the detection of clinically significant radiographic abnormalities and provides diagnostic clarification for the referring clinician, radiographic images provide the greatest benefit for the patient when they are reported immediately (Smith et al, 2009b).

Radiographic interpretation

Radiographic interpretation has become annexed to the scopes of practice of non-radiologist healthcare workers because one of the greatest problems facing radiology is the timely communication of significant radiological abnormal findings (Raskin, 2006; Berlin, 2008; McConnell et al., 2012). The historical evolution of radiography as a field of practice gave rise to a demarcation in responsibility between radiographers and radiologists. Despite the assertions in 1919 of radiologist Hernaman-Johnson (cited in Price, 2001, p. 107) that '...interpretation is ours for ever...', the vagaries of radiological practice have produced a climate in which the responsibility for the interpretation of radiographic images falls to other healthcare workers, such as doctors (Smith et al, 2009b; Queensland Government, 2011), nurse practitioners (Free and Lee, 2009) and radiographers (Smith et al, 2009b; Hardy et al 2010). The implication of this transfer of responsibility is that healthcare professionals with less radiographic interpretation expertise than radiologists are undertaking radiographic interpretation which may compromise patient care (Queensland Government, 2011). Radiographers, as established in chapter 1, are responsible for producing radiographic images and the potential diagnostic value of radiographic images is unassailable. Indeed this is the very reason the diagnostic benefits of its use were seized upon (Chavda and Pahor, 1996; Kron, 1996). A radiographic image however, is not a

diagnosis in itself; the diagnostic value of a radiographic image is not realised until it is read and interpreted.

Reading a radiographic image is a complex process and the difficulties associated with radiographic image interpretation were introduced in chapter 1. Radiographic image reading requires a mental three dimensional reconstruction of the two dimensional radiographic image, and the image reading process is further complicated because the radiographic image also contains a great deal of information not all of which is diagnostically relevant (Stender et al., 1989). The uncertainty associated with radiographic image reading means that the decision making is subject to errors and biases. It is this diagnostic error and variation that is a fundamental concept of this thesis and the literature shows that radiographers are well placed as an effective adjunct to facilitate an improvement to this weak link. But it is these very practices of interpretation, communication and disclosure of this interpretation that present the radiographic profession with many challenges. These challenges arise because radiographic image reading and interpretation leading to diagnosis is the documented domain of the radiologist. However, as the following section will demonstrate, while diagnostic radiology consists of the two fundamental steps of image acquisition and image reading (Pitman, 2006) and the responsibilities of the radiographer are aligned to image acquisition and those of the radiologist to image reading, the apparent delineation between the two professions is not as clear-cut as simple allocation of tasks causes it to appear.

Radiographic interpretation is a practice that sits outside radiographers' documented traditional scope of practice. It is radiographic interpretation's move from the traditional domain however, that may explain why it is well documented that Australian rural radiographers have for many years informally offered their radiographic opinion to referring clinicians (Hall et al., 1999; Smith and Lewis, 2002; Cook et al., 2004; Nuss, 2007; Smith, 2008). Radiographers adopting a task that sits outside their scope of practice means that difficulties arise in them providing their radiographic opinion to referrers because radiographers cannot produce a radiologist report. Healthcare reforms have complicated the referral lines of responsibility and communication as the literature reflects that a range of health professionals may now act as the referrer and so also provide radiographic interpretation. The aligning of the

responsibility for radiographic referral to various health professions introduces a number of variables including legislation, skill and specialist knowledge in radiographic interpretation.

In many countries, the referring clinicians are often doctors ranging in experience from junior to senior, but who may also be members of one of a number of other health professions. In Australia under the Medical Benefits Schedule³⁶ any Diagnostic Imaging Services³⁷ except for Magnetic Resonance Imaging³⁸ may be requested by a medical practitioner. A limited number of plain film radiography examinations, which are specified by the Medical Benefits Schedule, may also be requested by dental practitioners, physiotherapists, chiropractors, osteopaths and podiatrists. In Queensland, the *Radiation Safety Regulation 1999*, Schedule 3A³⁹ which lists persons authorised to request plain film radiography, includes a registered nurse under the *Nursing Act 1992*⁴⁰ who is authorised to practise as a nurse practitioner by the Queensland Nursing Council. The emergence of the nurse practitioner within United Kingdom (UK) Emergency Departments (ED) and also in Australia, has resulted in an increase in the number of health care professionals who may act as referrers and for whom radiographic interpretation falls within their scope of practice (Coleman and Piper, 2008). Yet, as there is little evidence that these health professionals are educationally prepared for radiographic interpretation, the risk of error associated with radiographic interpretation may be significant. Studies into the radiographic interpretation skills of UK nurse practitioners have indicated that the nurse practitioners had no formal training in radiographic image interpretation (Free and Lee, 2009) and junior doctors in Queensland are reported as having minimal training in interpretation (Queensland Government, 2011).

The various healthcare professionals who may find radiographic image interpretation within their scope of practice exhibit varying levels of skill in detecting

³⁶ Medical Benefits Schedule is a list of medical services subsidised by the Australian Government.

³⁷ Diagnostic Imaging Services are services that provide medical imaging of the human body for the purpose of diagnosis.

³⁸ Magnetic Resonance Imaging is a medical imaging technique used to visualise the human body that employs magnetic resonance technology.

³⁹ The *Radiation Safety Regulation 1999* is legislation that controls radiation use, safety and protection in Queensland.

⁴⁰ The *Nursing Act 1992* is legislation that prescribes a set of standards for nursing in Queensland.

radiographic abnormalities. As such, this has serious implications for accurate diagnosis and the risk of misdiagnosis for the patient is increased. One of the main clinical areas relying on radiographic images for diagnosis is the Accident and Emergency Department and these are often staffed by junior doctors (Guly, 2001; Queensland Government, 2011; Saunders, 2012) who are often inadequate at reading musculoskeletal radiographs let alone the more complex chest and abdominal plain film radiography. For instance, Taheri's (1999) study of 185 University of Tasmania senior medical students' ability to report radiographs found that, not only was the participants' overall standard of radiographic interpretation inadequate, but that the students also perceived that their learning experience in the field of musculoskeletal radiology was inadequate for preparing them for interpreting radiographic images. Too often radiographic interpretation, as a core component of radiology, is a peripheral addition rather than a core component of the medical curriculum (Cassumbhoy and Lau, 2007). This belies the importance of accurate radiographic interpretation.

The accurate interpretation of fracture radiographs is fundamentally important in medicine (Taheri, 1999) and, in the case of fractures, the radiographic image often provides objective evidence of that fracture. It seems there is an inaccurate assumption that medical school students will acquire the knowledge and skills of radiographic interpretation during their undergraduate studies (Taheri, 1999) but clearly this is not occurring. The Queensland Government reported in 2011 that junior doctors working in Queensland Health facilities usually had minimal training in radiographic image interpretation (Queensland Government, 2011). Radiographic interpretation may not just present as a difficulty for junior doctors. A study of rural and remote GPs with an average age of 46 years revealed that they identified radiographic interpretation as one their three priority needs in radiology education (Glazbrook and Smith, 2001). While the detection of a fracture improves with experience (Anderson et al., 2006), it is a relatively simple binary decision (Donovan and Manning, 2006). Chest and abdomen radiographs, however, involve images where the anatomy is more complex than musculoskeletal radiographs (Eyres and Thomas, 2005; Donovan and Manning, 2006), and as a consequence it is only possible to identify a radiographic abnormality when the reader is completely confident with what constitutes 'normal' (Eyres and Thomas, 2005). A further difficulty that exists with a lack of experience is '...secondary

ignorance... they do not know what they do not know...' (Dreyfus and Dreyfus, 1996, p. 194) and this significantly impacts on error.

Diagnostic Error in Radiographic Interpretation

It has been estimated that in United Kingdom emergency departments, 70% of missed diagnosis are the result of failure by emergency physicians to identify radiographic abnormalities (Willis and Sur, 2007). The results for one study revealed that United Kingdom Accident and Emergency Department Senior House Officers missed 35% of radiographic abnormalities and 39% of clinically significant abnormalities (Vincent et al., 1988, p. 106). The inference of this study's finding is that one in three abnormalities would be undetected by unassisted Senior House Officers⁴¹ (Vincent et al., 1988). In another United Kingdom study describing diagnostic errors that occurred in a busy Accident and Emergency department over a four year period from 1 August 1992 to 6 August 1996, it was found that 77.8% of the cause of diagnostic error was misinterpretation of radiographs mainly by Senior House Officers (Guly, 2001). The under-interpretation of radiographic images, which is the failure to identify a radiographic abnormality, is a source of perceptual error⁴². For example, a referring clinician succumbing to perceptual error in radiographic image reading may either fail to identify or dismiss as not clinically significant the subtle radiological signs of an evulsion fracture. There is evidence to suggest these errors and omissions are not limited to doctors. One prospective study involving four nurses working alone in a peripheral unit⁴³, and involving 300 patients documented a 10.7% error in image interpretation by these nurses (Benger, 2002).

A compounding factor in the error in radiographic image interpretation is that it has also been identified that both nurse practitioners and casualty officers may overrate their image interpretation abilities (Coleman and Piper, 2008). For instance, it has been reported that doctors underestimated the likelihood of error in their diagnosis (Jones and Crock, 2009) and, despite the documented error rate of 10.7%, it has been reported that nurses 'can also interpret these films to a high standard' (Benger, 2002, p. 70). To arrive

⁴¹ Senior House Officers are junior doctors undergoing training in certain specialties in the United Kingdom National Health Service

⁴² Errors in radiographic interpretation are described in chapter 1

⁴³ Peripheral unit is a medical facility that is remote from a base hospital.

at such a decision may be flawed if a positive comparison between the abilities of nurses and their medical colleagues leads to the assumption of a satisfactory level of competence (Hardy and Barrett, 2004; Free and Lee, 2009) when the assessment of the skill level of senior house officers has revealed marked variation (Hardy and Barrett, 2004). A complicating factor with regard to the reporting of the accuracy of nurse practitioners' radiographic interpretation ability is that in some cases, nurses have been privy to the radiographer's opinion (Free and Lee, 2009). While nurses having access to the radiographer's opinion may represent the 'real world' (Free and Lee, 2009), it does not accurately indicate nurses' radiographic interpretation ability but rather may represent the positive impact of collaborative decision making.

Unlike other health professionals, radiographers have demonstrated a positive correlation between perceived ability and actual skill in their image interpretation (Coleman and Piper, 2008). A conceptual hurdle to the evaluation of film reading performance is its relativity to patient outcome (Brealey and Scally, 2001) because the ultimate value of any diagnostic test should be judged by its impact on the wellbeing of the patient (Summerton, 2011). The problem with over-confidence in image interpretation leading to formation of a diagnosis is that, if confidence in a provided diagnosis is high, then patient management may be instigated on the presumption that the diagnosis is accurate (Ng and Palmer, 2007) even if the diagnosis is inaccurate and patient wellbeing may be compromised.

The consequences of a failure to detect a radiographic abnormality, which may be referred to as a diagnostic error, are that patients are wrongly discharged but then subsequently recalled on identification of the error (Vincent et al., 1988; McConnell et al., 2012). A diagnostic error may be defined as 'a diagnosis that could have been made in the A&E department but that was not made until after the patient left A&E' (Guly, 2001, p. 263). However, diagnostic error is more than a delay in diagnosis. All diagnostic errors have implications for patient care (Guly, 2001; Jones and Crock, 2009; Queensland Government, 2011; Summerton, 2011), and with non-reporting of films a diagnostic error may not be identified until it is too late to rectify the consequences of the delay. The errors or delays in diagnosis may be consequential because a delay in the diagnosis of a fracture may result in an increase in functional disability for a patient (Hyland-McGuire et al., 1997). For patients with cancer, a delayed diagnosis or false

negative diagnosis may not only have an adverse effect on the prognosis, but also the nature of the interventions that may be required (Summerton, 2011). The magnitude of the resultant cost to the patient of a diagnostic error ranges from distress through pain to perhaps a less favourable long term prognosis that may include ongoing disability or even a life threatening situation (Guly, 2001). The ultimate consequence of a diagnostic error may be the death of a patient.

To combat the potential for diagnostic error some radiographers seem to be attempting to reduce the risk of misinterpretation of radiographic images, and therefore reduce the risk of misdiagnosis. For instance, Smith (2008, p. 318) states, '[a]t times I volunteer my opinion to junior doctors and general practitioners. Thirty years of experience tells me that, if I don't they miss abnormalities, delaying treatment and decreasing the quality of care'. The situation described by Smith (2008) arises because misinterpretation is multifactorial and so there is not a simple solution to this problem. Finding ways to resolve radiologist workload issues and enable every patient to have every abnormality on their radiographic image identified and interpreted, are highly complex because of the current social, cultural and political context within which all health professionals' work⁴⁴. This is in part because it is an oversimplification to conclude that the answer to avoiding the potential for errors occurring in reading radiographic images would be to ensure the timely viewing of every radiographic image by a radiologist. William Hare, a radiologist and the first Australian Professor of Radiology, quashes this ideal as he reveals that even radiologists may make errors⁴⁵ (Hare, 2007). Indeed, it has been reported that perceptual errors occur in a significant number of radiologist-reported radiographic examinations (Renfrew et al., 1992). A review of 182 problem cases revealed 126 cases of radiologists' perceptual error (Renfrew et al., 1992). It has also been estimated that perceptual error may have resulted in approximately 20% of abnormalities being missed in radiologists' examinations of chest radiographs (Pitman, 2006). In the reports of a study from the UK, the most common reason for a missed diagnosis of lung cancer was that the

⁴⁴ For an overview of this complex workforce context revisit chapter 1, Background to the Study.

⁴⁵ Radiologist error introduces a flaw in the methodological approach adopted by studies into radiographer interpretation skill that compare radiographers to radiologists as a gold standard. The consequence of radiologist error is discussed further on page 82 and how error in interpretation may be mitigated is discussed on page 84.

radiologist failed to identify the abnormality (Summerton, 2011). It is this error and variation in radiographic image reading that is of central concern to this thesis.

Radiographers are well placed within the radiological pathway to act as an effective adjunct to facilitate radiographic interpretation. However, the communication of findings of radiographic abnormalities to referrers and the responsibility of radiographic interpretation present significant ethical dilemmas for radiographers. Radiographers' involvement in radiographic interpretation is supported in the literature by some radiologists, who believe that radiographers are ideally placed to complement the diagnostic pathway by providing some compensation for the inherent perceptual errors associated with film reading (Swinburne, 1971; Thomas, 2005; Pitman and Hare, 2007).

The idea that radiographers can supplement image interpretation is not new. In 1971 Kenneth Swinburne, a British radiologist, stepped aside from the etiquette of the day, when radiographers were viewed as technicians, and suggested that radiographers had the ability to discern normal from abnormal radiographs (Swinburne, 1971). In this paper, Swinburne (1971, p. 589) proposes that a radiographer's identification of abnormal is based on '...an almost instantaneous comprehension of form, shape, configuration, or pattern' rather than a detailed examination of the situation. He recommends that, as radiographers throughout the world were assisting doctors with interpretation of radiographs, this well-known, but not officially sanctioned fact, be tested so that it might receive official approval (Swinburne, 1971). The research that Swinburne suggested was never undertaken (Loughran, 1994). A radiologist from the USA, Harry Fischer, takes a contrary position to Swinburne as he suggests that radiology is not simply pattern recognition and so cannot be taught through repetitive experience (Fischer, 1972). Fischer believes that radiographic interpretation requires both the knowledge and intellectual capacity of a professional (Fischer, 1972). He categorises radiographers, whom he refers to as technicians, as non-professional and so considers them as incapable of radiographic interpretation (Fischer, 1972). Radiographers, however, are more than technicians. Although the radiographic image is central to radiographer's professional identity, as healthcare professionals radiographers possess a unique body of knowledge (Smith, 2007), that extends beyond image acquisition (Hardy et al, 2010). In delivery of their healthcare services radiographers

apply the knowledge of radiography which includes the theory, science, practice and art of radiography (Towsley-Cook and Young, 2007).

A radiographer is a health professional who uses clinical decision making skills in order to employ the appropriate imaging protocol to produce the optimum medical image for diagnostic interpretation in order to benefit the patient. A radiographer does not rely solely on a request form to determine examination requirements (Bowman, 1993) because radiographers need to understand why a radiographic examination has been requested to ensure that the best radiographic projections are obtained (Bontrager and Lampignano, 2005). Consequently radiographers have always been responsible for the selection of a particular technique to apply to a radiographic examination even if the imaging protocols have been determined by a radiologist (Price and Paterson, 1996). No matter what the presentation of the patient, and regardless of how each patient may differ from the next, the radiographer will adopt techniques that ensure the same imaging outcome for every patient.

It is their working environment that places the radiographer in a position to assess the patient clinically and, in conjunction with the images produced, make an informed assessment of that patient. In Australian clinical practice it is the radiographer, and not the radiologist, who discusses the request form with a patient and who may examine them prior to undertaking the radiographic examination (Egan and Baird, 2003). It is the clinical assessment of the patient, along with a patient's clinical history, that a radiographer uses to determine the radiographic projections that are necessary to answer the clinical question posed (Egan and Baird, 2003).

Knowledge of how an examination was performed facilitates image evaluation (Hare, 2007). Radiographers' accuracy in radiographic interpretation has been shown to increase from 88.3% to 95.8% when they had access to the patient (Queensland Government, 2011). In plain film radiography the centring point of the X-ray beam and patient positioning, both of which are the domain of the radiographer, affect the resultant image (Hare, 2007). Price (2001, p. 110) reports the view of a radiologist who, in correspondence in 1909, '...claimed that the person taking a radiograph and knowing the relative position of the tube, patient and plate at the time of the exposure was the only one who could interpret it correctly...'.

The timeframe between the articles by Fischer and Swinburne is only one year but these two radiologists were geographically continents apart with Swinburne in the UK and Fischer in the USA, and it would seem continents apart with their views on the capabilities of radiographers. Although technological advances have brought about marked change in medical imaging since 1970 (Smith et al, 2009a) and the scope of practice for Australian radiographers has evolved to include tasks once limited to radiologists (Freckelton, 2012) the role of the radiographer continues to be understated. Duckett⁴⁶ and Fischer alike have failed to see beyond the technical image acquisition component of radiography. Fischer's views are further debunked by the literature.

Despite Fischer's assertions to the contrary, evidence is presented in the literature that radiographers are capable of radiographic image reading (Hall et al., 1999; Price, 2001; Brealey et al., 2005; Gibbon, 2005; Smith et al, 2009b; Queensland Government, 2011). Indeed radiographers' radiographic interpretation skill level has been determined at 87% (Orames, 1997), 87.1% (Queensland Government, 2011), 90.6% (Renwick et al., 1991), 91.2% (Hall et al., 1999), 92% (McConnell et al., 2012) and 95.5% (Berman et al., 1985). In the UK an alternative model of practice to Australia has been adopted that involves training radiographers for frontline reporting (Smith et al., 2009a). A study presenting a synthesis of the literature in order to determine the accuracy of UK radiographers plain film reporting found a specificity of 92.6% and sensitivity of 97.7% (Brealey et al., 2005). The authors of this study determined that radiographers can accurately report plain films in clinical practice. An Australian study to evaluate the accuracy of a cohort of rural radiographers in interpreting musculoskeletal radiographic images determined that even prior to training these rural radiographers possessed a level of skill in radiographic interpretation (Smith et al., 2009b). This suggests that although their formal training may not have provided the avenue for their acquisition of radiographic interpretation skills, radiographers have nonetheless acquired these skills.

Anderson et al. (2006) proposes that it is over time that radiographers develop their understanding and knowledge of normal, normal variants and abnormal. Radiographers evaluate each radiographic image that they produce to ensure that it

⁴⁶ Duckett's comments on radiography are on page 31.

meets imaging criteria. It is through this process of evaluation that radiographers determine which radiographic images may require repeats and which are acceptable for diagnostic purposes (Bontrager and Lampignano, 2005). The imaging criteria applied by radiographers are that the radiographic image is at least diagnostically adequate to preferably diagnostically optimal. An optimal radiographic image demonstrates maximum detail, perfect patient positioning and displays optimal contrast and density with no artefacts (McQuillen-Martensen, 1996). Evaluating and critiquing radiographic images requires not only knowledge but also understanding of how a disease or condition may present on a radiographic image and how some pathology may impact on the quality of the radiographic image (Bontrager and Lampignano, 2005). As a result of their role in image evaluation throughout their career, radiographers see large numbers of radiographs and consequently acquire perceptual knowledge (Donovan and Manning, 2006) and it is proposed that this has allowed them to develop interpretation skills (Sonnex et al., 2001).

It is within the environment of the viewing room or tea room that the more experienced radiographers will relate tales of previous modes of practice and past experiences (Decker and Iphofen, 2005). The result is that the clinical practice of radiographers is based on historical knowledge along with knowledge provided by both their work environment and the wisdom of experienced radiographers (Decker and Iphofen, 2005; Rodhal Thingnes and Lewis, 2011). Seniority and experience have been attributed to a radiographer's ability to accurately diagnose radiographic abnormalities (Anderson et al., 2006) and experience as a precursor for acuity of diagnosis, applies also to the identification of unexpected and subtle lesions which may only be identified after viewing hundreds of such images (Dixon, 2006). Although radiographic interpretation is only one aspect of the role of a doctor or a nurse, it is the core of a radiographer's clinical expertise (Coleman and Piper, 2008). Other healthcare professionals are exposed to fewer radiographic images so may come to tacitly acquire a lower skill level (Coleman and Piper, 2008). The consequence of this lower skill level is a greater potential for error.

The competence of radiographers in the area of radiographic film reading has been achieved by gauging radiographers against qualified medical practitioners (Orames, 1997; Hall et al., 1999; Brealey et al., 2005). The assumption has been made

that the radiologist is 100% correct, this presents a methodological flaw when it has been recognised that radiologist may make errors (Renfrew et al, 1992; Pitman, 2006; Hare, 2007; Summerton, 2011) which brings into question the suitability of using radiologists as the reference standard (Brealey et al, 2005). For example a series of studies into the accuracy of radiographers at Alice Springs Hospital, in determining normal compared to abnormal radiographs, showed an overall accuracy of 91.2% against the 'gold standard' of the radiologists, report Hall, Kleeman and Egan (Hall et al., 1999, p. 11). In reporting the limitations of their study, the authors mention that they assumed that the 'gold standard' for the radiologists represented 100% accuracy, and if allowance is made for some inaccuracy by radiologists, then the results would potentially reflect a higher standard (Hall et al., 1999).

The literature presents evidence that radiographers not only possess a level of skill in radiographic interpretation but also performed significantly better than nurses in image interpretation both pre-training and post- training, so that overall the radiographers achieved a greater overall performance than those in the nursing group (Piper and Paterson, 2009). Furthermore, research has also demonstrated that radiographers had a higher score in image interpretation compared to both nurse practitioners and casualty officers (Coleman and Piper, 2008). Both of these studies involved UK health care professionals and used a test bank of images and so it is not possible to extrapolate the results of the studies to Australian clinical practice. These studies do however add weight to the argument that radiographers do have skill in radiographic image interpretation that the level of skill improves with training. Although radiographers who had not specifically trained in radiographic interpretation demonstrated a reasonable level of skill in radiographic image interpretation, often greater than other healthcare professionals, it has been suggested that they do not possess a skill level that would enable them to replace a radiologist (Orames, 1997; Freckelton, 2012). Others, however suggest that radiographers who were selectively trained in radiographic interpretation, exhibited the same skill level as radiologists of varying seniority (Brealey et al., 2005; Queensland Government, 2011). Brealey et al (2005) have drawn their conclusion into the skill level of trained radiographers from a meta-analysis of UK studies into the accuracy of radiographers reporting on plain radiographic images. The Queensland Government report may more accurately reflect the Australian situation as the conclusion resulted from a 22 day project trial in a

Queensland Hospital Emergency Department that involved radiographers undertaking a short course in image interpretation (Queensland Government, 2011).

The Australian model of practice for medical imaging differs from the UK and this is evident in the literature. Rather than radiographers taking on the role of the radiologist in reporting of radiographic images it is proposed that Australian radiographers compliment the radiographic imaging interpretation pathway by providing their radiographic opinion (Smith et al., 2009b; Hardy et al., 2010; Queensland Government, 2011). Radiographers' working environment places them within the diagnostic pathway between image acquisition and image interpretation, and it is this position that may allow radiographers to provide some compensation for the inherent perceptual errors associated with film reading (Pitman and Hare, 2007; Smith et al., 2009). The role for radiographers in decreasing the incidence of perceptual error can be explained in part by satisfaction of search phenomena, which is where the detection of one abnormality results in the failure to detect another abnormality within the same radiographic image (Hare, 2007). The satisfaction of search phenomena has been used as an argument for radiographers to address the issue of under-interpreting of radiographic images, which is a source of diminished accuracy in radiographic perception (Ashman et al., 2000). Significant satisfaction of search bias was demonstrated in a study of the interpretation skills in thirty skeletal plain radiographs by twelve radiologists and thirteen orthopaedic surgery residents (Ashman et al., 2000). In this study the detection rates for finding a single abnormality, whether the radiographic image contained one or more abnormalities, revealed no statistically significant difference, but the rate of detection of the second or third abnormality, was significantly lower (Ashman et al., 2000). Every abnormality was detected by at least one of the participants which indicates that satisfaction of search is not related to the abnormalities presenting as either too subtle or difficult to identify (Ashman et al., 2000). The arguable conclusion from the results of this study is that, if the participants had collaborated in the interpretation sessions, every abnormality on every film would have been identified.

Other studies have also found that multiple viewing of radiographic images reduces the number of abnormalities that are missed (Hall et al., 1999). The combining of two minds is better for the safety of the patient (Kamien, 2005) as collaboration

which allows crosschecking can result in the detection of erroneous interpretations early enough to mitigate or eliminate the negative consequences of diagnostic error (Jones and Crock, 2009). In 2013, this viewpoint can be extended with the argument about a shift away from mono-disciplinary monopolisation to a more collaborative approach to healthcare services. There is a clear role for radiographers to decrease the incidence of error in radiographic interpretation. From the literature it seems this can be achieved by addressing the under-interpreting of images, including the false negative errors and biases, and collaborating in interpretation with referring clinicians. Although classic double reading is conducted by two radiologists, the findings reported in the literature review suggest that the radiographer could be a suitable alternative. Put simply, radiographers can provide a ‘second pair of trained eyes’ (Cowan et al., 2007, p. 528).

Multidisciplinary Radiographic Interpretation

Radiographic interpretation requires a highly complex knowledge and skill set that would be best served by a multidisciplinary approach rather than charging one professional group with sole responsibility for this task. Nowhere is this more pertinent than in rural practice where multidisciplinary teamwork characterises the work model (Goldin, 1979; Best, 2000; O'Connor, 2000; Hays, 2002; Gibson, 2004; McBrien, 2005; Mills et al., 2010). The collaborative nature of working in rural healthcare is evident in Gibson's (2004) comparison of a small rural hospital to a stonewall where the radiographer is a small but essential part of the whole. Indeed, in smaller centres radiographers make a greater contribution to patient management due to the collaborative nature of working at a smaller site (Snaith and Hardy, 2008). It is argued that working in rural and remote areas requires a vast knowledge, not only in producing radiographic images, but more importantly in regard to film interpretation and diagnosis. Rural radiographers' participation in radiographic interpretation is clearly supported by the field literature (Hall et al., 1999; Smith and Lewis, 2002; Cook et al., 2004; Nuss, 2007). Furthermore, there is a high expectation of radiographers in rural areas to have intense skills in order to aid and advise medical staff, with experience and knowledge proving invaluable for rural practice (Von Bertouch in McBrien, 2005, p. 20). But it is the perspicuous statement by Smith (2009b, p. 1) that reveals the contribution radiographers make to patient management: ‘[i]n regional, rural and remote clinical practice, radiographers

work closely with medical members of the acute care team in interpretation of radiographic images’.

In metropolitan areas a radiographer generally works alongside a radiologist (Lewis, 2003) except in after-hours situations where radiographers often operate independent of a radiologist’s supervision (Smith and Lewis, 2003). However, in rural areas there may often not be a radiologist readily available regardless of the hour of the day (Smith et al., 2009b). Where a radiologist is not available, radiographers appear to contribute to the rural multidisciplinary team by providing assistance in image interpretation to healthcare professionals who may possess less experience in radiographic interpretation (Radovanovic and Armfield, 2005). Radiographers are not only providing their radiographic opinion, but in some instances it is actively sought by the referring doctor (Smith and Lewis, 2002; Queensland Government, 2011). Indeed, medical practitioners providing acute care to paediatric patients are now being advised that, if an experienced radiographer considers a film to be abnormal, their comments should be noted (Mackway-Jones et al., 2005). Although Cook et al. (2004) argue that it is unclear to what extent rural radiographers are providing informal verbal reports, it has been suggested that there is anecdotal evidence that a sole radiographer in a country hospital, which has infrequent attendance by a radiologist, may be called upon up to several times a day to assist local doctors with interpreting radiographs (Smith 1995). The Competency Based Standards Project suggests the provision of opinion on radiographic images, or a report on clinical findings by radiographers, is an important role, with only 9% of those surveyed claiming that they did not engage in either practice (Egan, 1993). Although it appears commonplace for rural radiographers to contribute their professional opinion (for example, Tony Smith, a rural radiographer, writes ‘I am frequently asked by doctors for my opinion about radiographs’ (Smith, 2008, p. 318)), it has been suggested that this practice is both unrecognised and unspoken (Egan, 1993).

Clearly radiographers are filling the gap that exists between the radiological service provided and patient care (Cook et al., 2004). The difficulty that exists for radiographers is that they are operating within a medical hierarchy where clinical staff may consider it inappropriate for a radiographer to draw their attention to a radiographic abnormality (Sonnex et al., 2001) because, as established in chapter 1, this is the domain of the radiologist. A complication of radiographers disclosing to referrers is that a

referring clinician may ignore a radiographer's indications of a radiographic abnormality (Brown, 2004; McConnell et al., 2012), suggesting that radiology continues to operate according to the same hierarchical⁴⁷ model that has been in place since the 1920s (Smith and Baird, 2007, p.629). As described in the previous chapter, this hierarchical model is comprised of radiologists and radiographers, with radiologists as medical professionals responsible for radiographic interpretation and radiographers responsible for radiographic image production. Sociologically, medicine has dominated radiography which has been viewed as a technical occupation (Decker and Iphofen, 2005). In other words, the medical profession has largely adopted a patriarchal position over radiography (Decker and Iphofen, 2005). In rural and remote areas, however, a radiographer may operate independently of a radiologist's supervision (Smith et al., 2009b) leaving radiographers without the professional support of a radiologist and necessitating that rural radiographers exercise both independent clinical judgement and decision making (Productivity Commission, 2005). This begs the question 'if radiographers are capable of operating independent of a radiologist at some times then why not others?' Radiographers' responsibility with regard to interpretation and disclosure is unclear and this is evident in communication with referrers.

Communication with referring clinicians: limitations and management

Rural radiographers' role in radiographic interpretation presents them with the daily requirement to make decisions about the type and degree of information they can provide about those interpretations for referring clinicians and patients. In order to make their decisions about communication and disclosure, radiographers draw on legal and ethical frameworks (Lynn 1999). While it is recognised that radiographers may have a professional and moral obligation to communicate their radiographic opinion, the guidelines that promote communication are ambiguous. It is little wonder that Australian radiographers are concerned with the medico-legal implications associated with these areas of role extension (Anderson et al., 2006) when significant ambiguity exists in the literature around radiographers' ethical and legal standing with regard to communication and disclosure of their radiographic opinion. This section examines the

⁴⁷ Hierarchy is discussed on pages 48, 208 and 256

literature pertaining to legal frameworks and the ways in which they impact on radiographic practice.

Australian radiographers have no legal diagnostic duty to their patients or liability for non-disclosure of their opinion with regard to examination findings (Smith, 2006b). Despite this apparent lack of diagnostic duty from a legal perspective, the Australian Institute of Radiography in their *Guidelines for professional conduct for Radiographers, Radiation Therapists and Sonographers* advise radiographers to ‘...alert medically significant findings to the medical personnel responsible for the patient’s treatment and at the request of such personnel ... provide an opinion that lies within their knowledge and expertise’ (Australian Institute of Radiography, 2007, p. 3). Advice from legal sources indicates that radiographers’ offering of their professional opinion falls within the realm of radiographic professional practice (Egan, 1993). It has also been reported that ‘[t]he provision of written descriptions by a radiographer is a clinical roles delineation and scope of practice issue and not a legal issue’ (Devaney and Gordon cited in Freckelton, 2012, p. 30). Radiographers therefore have a professional obligation to provide their radiographic opinion when confronted with a dangerous situation, or if in the absence of a radiologist their opinion is sought by medical staff (Egan, 1993)⁴⁸. Egan outlines three provisos for radiographers to disclose information and advises these are made clear at the outset: firstly, that the radiographer identifies themselves as such; secondly, the responsibility for diagnosis and treatment still rests with the referring physician and thirdly, that competency is dependent upon the experience of the radiographer who must also take the responsibility for their informed opinion (Egan, 1993).

The advice is clear that radiographers should alert the referring clinician to medically significant radiographic findings. Ford (1992, p. 126), a radiographer and barrister and solicitor, suggests that ‘[i]f no radiologist is available and you view something you consider of importance to the patient that is beyond the strict limitations of your qualifications, then ring the referring doctor’. Ford does not define strict limitations of qualifications but he does reveal that with regard to standard of care, it is not possible to have a precise definition because by its nature it must be fluid so that it

⁴⁸ Although this article by Egan may be considered dated it appears that guidelines for radiographers to communicate their opinion to medical staff remains a neglected area of the radiographic literature.

can still work within different social and technical situations (Ford, 1992). It is this necessity for fluidity in social situations that is of principal interest in this study and which underpins both the focus of the study and the choice of methodology.

In addition to the ambiguity surrounding when radiographers should alert a referrer, there remains ambiguity as to **how** radiographers should alert referring doctors to a medically significant radiographic abnormality because, apart from Ford's suggestion to ring the referrer, no advice is offered. It is suggested that the guidelines provided by the AIR currently require radiographers to track down the referring clinician and verbally discuss the presence of a radiographic abnormality on a patient's radiographic image (McConnell et al., 2012). The literature demonstrates that, in response to the lack of direction, radiographers have implemented technical and pragmatic strategies for managing the way information about radiographic interpretation is highlighted and communicated to referrers. The field literature indicates that this is done in a way that sidesteps the need for radiographers to explicitly interpret and diagnose. Radiographer Abnormality Detection Schemes (RADS) which incorporate the Radiographer's Opinion Form (ROF) (Smith and Younger, 2002; Smith et al, 2009) and the Radiographer Abnormality Detection (RAD) (Queensland Government, 2011) worksheet are the significant strategies reported.

Radiographer Abnormality Detection Schemes

One of the initiatives that goes some way to addressing and formalising the issue of radiographers communicating radiographic information to referrers are Radiographer Abnormality Detection Schemes (RADS). These schemes allow a radiographer to notify a referring clinician of an abnormality on a radiographic image prior to a radiologist issuing a formal report. The first RADS appeared in the United Kingdom in 1981 (Cheyne et al., 1987) with the introduction of the red dot scheme (Snaith and Hardy, 2008). The purpose of the red dot system was initially to alert Casualty Officers at the Ealing Hospital to radiographic abnormalities (Cheyne et al., 1987). The identified need for such a system arose as a result of a missed diagnosis where the radiographer had identified on a radiographic image an impacted fracture of the neck of the femur but the patient was discharged because the Casualty Officer misinterpreted the film as normal (Field-Boden, 1997). The scheme that the radiographers and their

colleagues at Ealing Hospital constructed to reduce diagnostic error by casualty officers, is inherently simple yet effective. The red dot system involves a radiographer examining the radiographic images and, on identification of an abnormality, placing a red dot on the radiographic image or film packet. While it may seem that the red dot system would be an effective way for radiographers to alert the referring clinician to an abnormality on a patient's radiographic image its flaw is that it does not require accurate identification of the site or the nature of the suspected pathology (Smith and Younger, 2002) and this further adds to the ambiguity that surrounds radiographers' responsibility for radiographic interpretation, communication and disclosure. A further limitation on the use of the red dot system in Australia is its sporadic introduction (Smith, 2006b). Despite its limitations, the introduction of the red dot system represents radiographers stepping beyond technical imaging acquisition into radiographic image reading. It is the patient-centred nature of radiography that resulted in the development and adoption of a radiographer-driven incentive to not only assist referrers but ensure timely and appropriate treatment for the patient.

The benefit of implementation of the red dot system to the patient may be significant. The results of a study by Willis and Sur (2007) revealed that an 80% probability of an abnormality being present on a radiographic image awarded a red dot by a radiographer not specifically trained in radiographic interpretation rose to 89% when the opinion of the Senior House Officer was introduced. Cheyne, Field-Boden, Wilson and Hall (1987) claim that after a period of five years post-introduction of the red dot system, Ealing Hospital had a rate of 98% in radiographically detected abnormalities. These authors hold the further view that radiographers contribute to this rate by detecting 25% of abnormalities that would have escaped detection by casualty officers (Cheyne et al., 1987). Studies examining Radiographer Abnormality Detection Scheme have reported varying degrees of high false positives by the participant radiographers (Berman et al, 1985; Renwick et al, 1991; Oram, 1997; Smith and Younger, 2002). This phenomenon has been attributed to radiographers being cautious and in cases of uncertainty indicating a positive rather than negative finding (Smith and Younger, 2002; Radovanovic and Armfield, 2005). Smith and Younger (2002) believe there is an argument to support that a high false positive is better than a high false negative. A false positive introduces potential for increased costs associated with unnecessary treatment of a patient with no radiographic abnormality (Smith and

Younger, 2002) however a false negative indicates a missed radiographic abnormality (Radovanovic and Armfield, 2005) and introduces the gamut of potential negative impact on the patient that may result⁴⁹. Although RADS are not without their limitation a study into current practice of radiographers and the value of Radiographer Abnormality Detection Schemes in the United Kingdom has shown that ‘...radiographers are making a significant contribution to the decision making process for patients attending the ED or MIU’ (Snaith and Hardy, 2008, p. 281).

Prior to the implementation of the red dot system, no established way existed for the radiographer to alert the casualty department to a demonstrated radiographic abnormality (Snaith and Hardy, 2008). The red dot system can therefore be interpreted as a way of radiographers attempting to manage the legal and ethical ambiguity surrounding their responsibility in communicating their radiographic interpretations to referrers. In drawing a medical practitioner’s attention to an abnormality on the radiographic images and so avoiding the inappropriate discharge of a patient requiring further care, two bioethical principles have been identified as applicable to the use of the red dot system, namely the principles of beneficence and non-maleficence (Smith, 2006b). The principles of beneficence and non-maleficence would also apply to any RADS or situation in which a radiographer participated in communication of their radiographic opinion to a referring clinician for the benefit of the patient.

The literature has demonstrated that Australian rural radiographers are undertaking radiographic interpretation and, with the exception of the use of the red dot system, their communication with referrers is informal. With significant evidence to show that radiographers are adept at radiographic interpretation (Hall et al., 1999; Price, 2001; Brealey et al., 2005; Gibbon, 2005; McConnell et al., 2012) and the increase in workloads for radiologists, it has been proposed that some appropriately trained Australian radiographers could undertake radiographic reporting (Gibbon, 2005; Smith and Baird, 2007; Smith et al., 2009a). Already in the UK a number of radiographers employed within the NHS are reporting on musculoskeletal, abdomen and chest radiographic images (Smith and Baird, 2007; Hardy et al., 2008; Hardy and Snaith, 2009; McConnell et al., 2012) to the extent that almost 60% of UK hospital sites have

⁴⁹ Misinterpretation of radiographic images and diagnostic error are discussed on page 76 and 77.

radiographers employed to report on trauma radiographs (Hardy and Snaith, 2009). In Australia, the Productivity Commission (2005) believes that there is scope to draw from within the Australian and overseas experience of innovations in healthcare already trialled for expanded scope of practice, and mentions radiography and sonography amongst other health professions (Productivity Commission 2005, p.65). This conclusion may have been reached from submissions such as the following:

No plain film reporting is occurring within many hospitals due to the absence of sufficient radiologist resources to formally read and report these. It is imperative that radiographers are trained to read and report plain films, particularly films that require rapid reporting such as within an emergency department. International evidence substantiated through meta-analysis and published in February 2005 indicates radiographer competence as being equivalent to radiologists in this function, if appropriately trained (Gibbon 2005, p.5-6).

A report by the Advanced Practice Working Group (APWG) of the AIR recommends that, under a proposed framework for advanced practice, appropriately trained and supported radiographers could undertake frontline or hot⁵⁰ reporting of appendicular and axial skeletal radiographic images in Emergency Departments (Smith et al., 2009a). The APWG report further suggests that radiographers might also undertake cold reporting dependent upon local need and circumstances or even enter their radiographic opinion into the PACS (Smith et al., 2009a). The rationale for such decisions is supported by the literature where it has been reported that ‘[t]here appears to be no reason why some radiographers could not reach the academic standard needed to provide descriptive reports on a defined range of radiographic examination types’ and that transferring some reporting from radiologists to radiographers would maintain or even improve patient care (Smith and Baird, 2007, p. 631). Despite the recognised current limited use of the red dot system in Australia (Smith, 2006b; Hardy et al., 2010), it has been suggested that the use of schemes such as the red dot will be a future role for radiographers working in acute care environments (Smith et al., 2009a). Such initiatives would formalise radiographers’ radiographic interpretation and communication through radiographic reporting.

⁵⁰ Definitions of hot and cold reporting are provided on page 54.

While the benefits to the patient of the red dot system are apparent, it does not provide answers to all issues that may arise with image interpretation, communication and disclosure. At a meeting of the Midland Branch of the United Kingdom College of Radiographers held in November 1993, a Mr Tim Reynolds raised a point worthy of discussion (Payne, 1994). At this meeting Reynolds suggested that the red dot system was a waste of time and that, if a radiographer sees an abnormality on a radiograph, then they should say what it is rather than just attach a red dot to either the radiographic image or the film packet (Payne, 1994). Reynolds' suggestion that the red dot system is a waste of time is questionable, as the double reading of a radiographic image has been shown to decrease the rate of perceptual error. However, the validity of his claim that radiographers should be able to say what they see, is readily recognised in light of satisfaction of search bias⁵¹. To overcome the shortcoming of the red dot scheme in non-specifically flagging an identified radiographic abnormality, Smith and Younger (2002) developed the Radiographer's Opinion Form (ROF). The ROF was developed as a data collection sheet for measuring the ability of radiographers to interpret Accident and Emergency plain radiographic images (Smith and Younger, 2002). The ROF allows a radiographer to identify both the site and the nature of a radiographic abnormality (Smith and Younger, 2002). The ROF was developed in 2001 by Smith and Younger, reported in 2002 and employed again by Smith, Traise and Cook in 2009 to test the interpretation skills of radiographers. Another form of RADS, that steps beyond the red dot system, is the Radiographer Abnormality Description (RAD) worksheet. A RAD worksheet, as a means for radiographers to communicate radiographer findings to Emergency Department clinicians, was designed and trialled in Queensland. The results of this 22 day project highlight the contribution that radiographers can make to patient care when radiographers identified an abnormality in eight cases that had been missed by the referring clinician (Queensland Government, 2011).

The Australian radiographic literature however, is largely silent on RADS that will allow informed comment such as ROF and the RAD worksheet and so it appears

⁵¹ Satisfaction of search bias is demonstrated in this instance if a radiographic image contains two abnormalities and the radiographer detects abnormality one and the referring clinician, although alerted to the fact that the radiographer suspects a radiographic abnormality, detects abnormally two, then the full potential of radiographer abnormality detections schemes is not realised.

that these communication dispatches have failed to gain widespread clinical use by Australian radiographers. This is important because Australian radiographers are left with the problematic and only sporadically employed red dot system for managing the ambiguity surrounding the ethico-legal consequences of communicating radiographic information to referrers. The use of the red dot system in contemporary radiographic practice is becoming more problematic because technological advances have led to the development and use of sophisticated information sharing devices for the display of radiographic images.

The technical evolution in image acquisition and display stands to reduce the use of traditional forms of RADS. It has been suggested that Picture Archiving and Communication System (PACS) may allow for immediate reporting to become more widespread and consequently remove the need for the red dot system (Willis and Sur, 2007). Although heralded as an advance, the use of PACS requires further critical interrogation because the images available for viewing on PACS have not necessarily been reported. In his study of the introduction of PACS into the Norfolk and Norwich University Hospital in the United Kingdom, Pilling, a radiologist, identified two important factors. First, for many hospital staff the report is as important as the images themselves, and second, it was considered by his respondents a disadvantage of the PACS system when reports are not available (Pilling, 2003). The lack of a radiology report is not a result of the introduction of PACS but rather a function of radiology management (Pilling, 2003). It seems there is work to be done in order to determine the best practice for radiographers to adopt to disclose their radiographic interpretations effectively to referring clinicians because radiographer abnormality detection schemes (RADS) are potentially hampered by the introduction of PACS (Snaith and Hardy, 2008). Clearly PACS is not the panacea because a timely radiologist's report is not always available, and with PACS it is impossible to place a red dot on a radiographic image or film packet in a filmless system. In the UK the use of digital imaging and PACS has seen the introduction in some centres of a digitally applied star, the new red dot, onto digital images to alert the referring clinician of a radiographer-identified radiographic abnormality (Saunders, 2012). Under the new informed comment system, UK radiographers will also be able to provide the referring clinician with a written aid to diagnosis such as '...a transverse fracture of the left distal radius, with posterior displacement of the distal fragment. This is a Colles fracture/dinner fork abnormality'

(Saunders, 2012 , p. 13). A limitation of the red dot system in Australia is that it has been inconsistently implemented and has not been adopted as standard practice (Smith et al., 2009a) so it is not a system that may be readily available for radiographers to employ. Consequently there may be no avenue for radiographers to provide either a red dot or a digitally produced star on a radiographic image to alert referring clinicians of a radiographer-identified radiographic abnormality. While the red dot system provides a documented method, albeit underutilised for communication with referrers, there is no such clear pathway for disclosure to patients.

Disclosure to patients: difficulties and ethical implications

Ambiguity surrounding radiographers' responsibility in communicating their radiographic interpretation to referrers is also apparent in the literature in relation to radiographers' disclosure of information to patients. Similarly, the ambiguity is of a legal and ethical nature. Patients overwhelmingly wish to have the results of their medical imaging examinations revealed to them (Schreiber et al., 1995; Berlin, 2007), but patients encounter difficulties accessing information during the diagnostic stage (Gilbert et al., 2011). Patients have become more demanding (Fischer, 1972; Schreiber and Winslade, 1987) and '[s]ome patients will not be satisfied with being told that the radiologist will report the results to their doctor, especially when they know that the radiologist is already aware of the results' (Schreiber and Winslade, 1987, p. 269). With plain film radiography, which is the imaging technology at the basis of this study, there is no personal contact between a radiologist and a patient. It is only with interventional techniques, such as ultrasound or mammography, that there will be personal contact between a radiologist and a patient (Schreiber and Winslade, 1987; Harvey et al, 2007). Australian radiologists have not only become distanced from their patients (Kenny and Pacey, 2005), but may be invisible to them (Doss, 2007). Indeed in rural and remote health facilities there is often no attending radiologist (Smith et al, 2007).

The immediacy of the radiological environment means that it is the radiographer who becomes symbolically associated with the all-important X-ray results (Goldin, 1979). Patients are less concerned about understanding whose role encompasses interpretation and disclosure than with acquiring the results for their radiographic examination. It is as a consequence of this association that patients may question the

radiographer for information as to what is demonstrated in a radiographic image (Dimond, 2002, p. 172). The literature suggests that requests for disclosure present an ethical dilemma for radiographers because the traditional model in radiology is that a radiologist reports the results of diagnostic imaging examinations to the referring clinician and not directly to the patient (Schreiber and Winslade, 1987; Berlin, 2007). Patients, however have a right to the truth (Schreiber and Winslade, 1987; Tuckett, 2004), which introduces patient autonomy and veracity into the ethical debate around radiographers' disclosure to patients (Lewis, 2002).

During a radiographic examination the patient is in the care of the radiographer alone and as a result it is the radiographer who must make the decisions and solve any problems arising (Campeau, 1999; Lam et al, 2004). It is this situation that introduces the centrality of the patient to radiography because the very fabric on which the technical skills of radiographic practice is based is people (Tress, 1991). While radiography may have a technical component in that it is outcome driven, it is nevertheless a social world (Hammick, 1995) and '...it is the radiographers' social interaction and not the hard technology that is decisive in any imaging procedure' (Murphy, 2006, p. 173). It is the complex humanistic dimension and the very clear patient focus that presents radiographers with a dilemma around disclosure.

Patients look to radiographers for disclosure because lengthy waits for diagnostic information produce anxiety (Berlin, 2007; Gilbert et al., 2011; Summerton, 2011). The results of the radiographic examination are perceived by a patient as confirming good health at one end of the health continuum through disability and pain to perhaps even death at the other end (Goldin, 1979). When patients wait for a diagnosis their speculations about the results of that examination may well be worse than the truth (Vallely and Mills, 1990; Tuckett, 2004). This is understandable because for the patient a positive diagnosis results in a trajectory that involves treatment and prognosis (Jutel, 2010), and so the stress that a patient experiences as a result of diagnostic uncertainty may be alleviated by an immediate reassurance of a negative finding or explanation (Vallely and Mills, 1990; Tuckett, 2004). The alleviation of stress introduces the principles of beneficence and non-maleficence into the ethical debate around rural radiographers' disclosure to patients. Although a study by Levitsky et al. (1993) shows a trend away from support for radiologists disclosing a diagnosis to a patient, it appears

patients want to be told examination results regardless of what they reveal (Schreiber et al., 1995; Tuckett, 2004; Berlin, 2007). A complication for rural radiographers is that rural practitioners are more likely to know their patients (Warner et al., 2005). It appears the pressure put on radiographers by patients to disclose their radiographic opinion, coupled with the ambiguity surrounding the ethico-legal responsibility of disclosure to patients, is challenging radiographers because there is evidence that, in order for them to disclose to patients, they must have adopted strategies for managing disclosure.

The literature has revealed that patients are requesting diagnostic information from radiographers but radiographers are not confident in their knowledge of what information they may disclose to their patients (Lewis, 2002). This raises questions around radiographers' replies. Lewis (2002) reveals that the 1995 version of the *AIR Guidelines for professional conduct for Radiographers, Radiation Therapists and Sonographers* did not offer any guidance to radiographers with regard to disclosing information to patients nor can any guidance be identified in the 2007 version of these guidelines (Australian Institute of Radiography, 2007). This is contrasted by the 2004 version of the United Kingdom College of Radiographers statements for professional conduct which offers 'Radiographers may discuss directly with the patient the outcomes of their investigation/treatment in accordance with local procedures' (College of Radiographers, 2004, p. 20). However no such advice could be identified in the 2008 Code of Conduct and Ethics produced by the United Kingdom Society and College of Radiographers. In advice to Australian radiographers Ford (1992, p. 126) suggests that '[o]nly in the very rarest of circumstances should you ever need to directly explain to a patient anything more than the practicalities of radiation safety and examination procedure'. Furthermore a discussion paper presenting the results of a search of the Australasian Legal Information Institute for information on disclosure by sonographers⁵² failed to unveil '...any statutory authorisation or restriction on the provision of information by sonographers to patients' (McPhee, 2003, p. 10).

Despite the assertions that there are no statutory limitations on the provision of diagnostic information to patients, others offer a contrary position. Willis (1994)

⁵² Sonographers are another of the medical imaging professions.

reveals that a radiographer is not allowed by law to interpret a radiographic image for a patient and this is supported by Dimond (2002) who suggests that many radiographers are specifically instructed not to provide a patient with an idea of the significance of their radiographic examination until a doctor has viewed the radiographic image and met the patient. Further support is placed behind the argument that radiographers cannot according to law provide diagnostic information to a patient from a 'Legal Issues for the Medical Radiation Workforce' seminar held on 10 May 2008 at the Skills Development Centre at The Royal Brisbane Women's Hospital. At this seminar Joanne Collins, a member of the Minter Ellison Lawyer medico-legal team, gave a presentation that in part covered legal guidelines for discussing diagnosis with patients (Ferrari, 2008). In reply to the question 'How much can you tell a patient about their condition?' Collins displayed a PowerPoint slide containing a section of the *Medical Practitioners Registration Amendment Act 2005 (Queensland)*. Collins interpreted this Act for the audience by saying: 'practically speaking it makes it an offence for anyone other than a medical practitioner to perform this type of role', and further suggested to the audience that 'you have to think am I giving a diagnosis, if you are giving a diagnosis then you shouldn't be doing it' (Collins, 2008). This is unequivocal advice from Collins: in Queensland according to the *Medical Practitioners Registration Amendment Act 2005 (Queensland)*⁵³ radiographers must not offer a diagnosis to a patient.

Collins' advice comes into question however, when the section of the *Medical Practitioners Registration Amendment Act 2005 (Queensland)* she refers to in her seminar presentation is viewed in its entirety. Interrogation of this section (s 161) of the *Medical Practitioners Registration Amendment Act 2005 (Queensland)*, reveals that the offence exists in providing a diagnosis 'under colour or pretence' of being a registered medical professional according to the Act. A line of argument that clearly follows from this interrogation of the act is that if a radiographer follows Egan's (1993) guidelines and identifies themselves as a radiographer prior to disclosure, then no breach of the legislation would exist. Collins appears to be perpetuating the myth that radiographers cannot, according to law, provide diagnostic information to a patient. Information about what radiographers believe in regard to legislative limitations to disclosure is valuable. What people believe is more important than the objective reality of existing legislation

⁵³ The relevant section of the *Medical Practitioners Registration Amendment Act 2005 (Queensland)* is attached as Appendix D.

as people act on what they believe (Murphy, 2001). It is not clear from the literature what radiographers believe about the legislative restrictions of their disclosure to patients. Indeed, it is not known if there are legislative restrictions to radiographers' disclosure to patients⁵⁴. Radiographers' position with regard to disclosure remains unclear in 2012. The AHPRA standards for practitioner behaviour under the Medical Radiations Practice Board of Australia *Code of Conduct for registered health practitioner* advise that '[a]n important part of the practitioner-patient/client relationship is effective communication. This involves...discussing with patients or clients their condition and...responding to questions from patients or clients and keeping them informed about their clinical progress...' (Medical Radiation Practice Board of Australia, 2012 , p. 6). This advice is offered under the proviso that the code is not a substitute for relevant legislation and '[i]f there is a conflict between the code and the law, the law takes precedence' (Medical Radiation Practice Board of Australia, 2012 , p. 2). Exploring whether radiographers are indeed making strategic choices around disclosure and the beliefs and values that underpin their choices is an important focus of this study. Furthermore, an exploration of this more humanistic side of radiography contributes to the field knowledge about a profession that is principally understood in technological terms.

The science component of rural radiography, that aspect of radiography that covers the skills necessary for image acquisition, is well documented and recognised as the technical aspect of radiographic practice. The history of radiography outlined in chapter 1 alludes to its scientific origins. The result of the scientific origins of radiography is that the majority of research around radiographic practice has been framed within traditional scientific methods. Traditional research is the application of a scientific method to create objective knowledge (Alvesson and Skoldberg, 2005). The

⁵⁴ In an attempt to clarify the legalities surrounding communication and disclosure by radiographers, a search was undertaken to identify any legislation limiting radiographers' disclosure to patients utilising the Australasian Legal Information Institute website www.austlii.edu.au. This website was interrogated using the descriptors "diagnosis", "diagnose", "disclose", "radiographer" and "radiography" which failed to identify any Australian legislation that explicitly states that radiographers cannot disclose radiographic results to a patient. A limitation of identifying such legislation is that the radiographer legislation identified does not say that a radiographer may not offer a diagnosis but rather it is a matter of excluding other legislation that limits those who may offer a diagnosis to a patient. The *Medical Professionals Registration Amendment Act 2005 (Queensland)* is an example of legislative limitations of diagnosis. The relevant section of the *Medical Professionals Registration Amendment Act 2005 (Queensland)* is attached as Appendix D.

background and the literature review have shown that the professional fields of radiography and radiology are the consequence of the application of traditional scientific method. These origins have extended into the nature of research within the field of radiography⁵⁵ and research in radiography has historically been drawn from, and influenced by, the natural science methods of other disciplines. Radiographic practice sits within a biomedical framework, which provides a compounding factor for the history of quantitative approaches to radiography research. As a consequence of this biomedical framework, radiographic practice is driven by quantitative outcomes (Hammick, 1995) with the result that research in radiography has been strongly influenced once again by the positivist tradition (Ng and White, 2005). Clinicians and physicists initially led radiography research (Hammick, 1995; Smith and Lewis, 2002; Adams and Smith, 2003) resulting in an arsenal of methodological tools that have been drawn from for research into clinical radiography and include clinical trial, experimental design and survey with associated statistical analysis (Adams and Smith, 2003). These functional descriptions of radiography are reductionist (Colyer, 2004). The late move to university based education for radiography⁵⁶ has meant that research by radiographers examining radiography is a relatively new occurrence (Smith, 2006a) with the consequence of an initially weak research base in radiographic practice (Cowell, 1999; Willis et al., 2005). The initially weak research base in radiographic practice is the result of a research environment where radiographers were stifled by a culture of low expectation in research, and where radiographic research had no place: as a consequence of their hospital based training few practising radiographers possessed the knowledge or skills necessary to investigate the nuances of their workplace (Hammick, 1995). Collectively these factors have resulted in a lack of evidence explaining radiographic practice (Smith, 2006a). Although there are Australian radiographers such as Lewis (2003) and Smith (2006a) adopting other than a positivist paradigm to their research, the basis for radiography research has largely involved measuring technical aspects of radiography with less focus on the human aspects (Decker and Iphofen, 2005). In this study of rural radiography, to apply a strictly reductionist framework

⁵⁵ It was the application of scientific method that through the experimentation of Professor Wilhelm Conrad Roentgen lead to the discovery of x rays on 8th November 1895 (Ryan, J., et al. 1996).

⁵⁶ Radiography's late move to university based education is discussed in chapter 1, page 36.

would prove problematic⁵⁷ because the knowledge and practices on which biomedicine is based is not just technical knowledge (Gordon, 1988b).

The bias on the presentation of the technical knowledge of radiography in the literature has resulted in the documented picture of a radiographer as one who uses their technical skills to acquire images as the overriding perception of what a radiographer does. However, the technical skills of radiographic practice are not applied in isolation but are applied to people (Tress, 1991). It is this social interaction that is integral to radiography (Murphy, 2006, p. 173). In 1943 general radiography was described by a Scottish radiologist as both an art and a science (Furby, 1943). Despite the ensuing years and medical imaging technology moving like ‘fast-moving lava’ (Allin, 2011), general radiography is still described as combining both art and science (Allbutt, 2011). The relationship between the two metaphors may be portrayed as one learns ‘science’ and it is then in application of the ‘science’ to patient care that ‘art’ comes into play (Gordon, 1988a). The modes for the acquisition of the formal science component of radiography are achieved by following the formal pathways for acquiring explicit knowledge by undertaking an undergraduate degree or hospital based training. The art of radiography, however, is that component of clinical knowledge that applies to the care of individual patients (Gordon, 1988a) and is acquired informally through radiographers’ interaction within their practice world. The answer to rural radiographers’ behaviour with regard to communication and disclosure appears to lie in the art of radiography. Indeed caring and communication are at the cornerstone of the art of radiography (Towsley-Cook and Young, 2007). This study, which explores the practice world of the rural radiographer and specifically their experience and understanding of communication and disclosure of their radiographic opinion, has its foundation in this premise.

Summary

There is a focus on the technical aspects of radiographic practice in the published literature. In part this may be explained by the research approaches and the conceptual frameworks predominantly used within the field. Most studies in the radiographic

⁵⁷ The problematic nature of the application of reductionist framework to research into radiography is described further throughout chapter 3.

literature tend to be framed within the biomedical perspective and its associated quantitative paradigms and, while these are useful for examining the technical aspects of rural radiographic practice, they are less useful for describing and interpreting the human dimension of such practice. This lack of literature may be due to the heavy focus on the technical aspects of radiographic practice with little consideration of the humanistic dimension of rural radiographic practice and the informal nature of these aspects of rural radiographic practice. It seems that there may be a tacit dimension to understanding how rural radiographers approach interpretation of radiographic images and dissemination of this diagnostic information to both patients and referrers because these are not well described in the literature. There is an urgent need to make such practices more visible in order to understand them and assess their effectiveness as a way to manage the ambiguous nature of radiographic interpretation, communication and disclosure. However, the way these tacit understandings position rural radiographers from an ethical perspective, is largely unexamined and unknown. Unearthing rural radiographers' experience, interpretation and understanding of radiographic interpretation, communication and disclosure, requires new research and theoretical frameworks. The next chapter outlines the theoretical perspectives adopted to explore these hidden and unspoken aspects of rural radiographic practice.

Chapter 3: Theoretical Perspectives

Introduction

The previous chapter revealed that rural radiographers are involved in radiographic interpretation, communication and disclosure of radiographic opinion despite their having little formal training or guidance in this dimension of their practice.

Radiographic practice is constructed and understood through two main artificial separations⁵⁸. Firstly, there is the artificial separation between rural and urban practice. Rural radiography however is much more complex and dynamic than artificial separation allows and presents radiographers with ethical dilemmas that they must navigate. Secondly, there is an artificial separation between the technical and humanistic dimensions of radiographic practice. Radiographic interpretation, communication and disclosure by radiographers exist in those informal and largely undocumented humanistic practices that sit outside the job description for a radiographer. As Peter Rouse in his 'Future Directions Working Party' report to the 55th Annual General Meeting of the AIR held on 14 May 2004 revealed: the '... environment is... ripe to seize the opportunity to formalise what we are currently doing informally...we do many things that would probably be considered outside a job description and we do it routinely' (Australian Institute of Radiography, 2004, p. 16). The predominance of scientific inquiry and technological understanding as the basis for radiography research has not been useful for undertaking this task. Therefore, in order to advance the hidden understanding of radiographic interpretation and subsequent communication and disclosure of their radiographic opinion by rural radiographers, it was essential to identify a more useful theoretical framework for this study. This study combined social constructionist, socialisation and ethical theories into a theoretical framework to allow the complexity of rural radiographic practice to be captured and examined. These theories are outlined in this chapter.

⁵⁸ This artificial separation, rural and urban, technical and humanistic is discussed throughout chapter 1, Section 2: Background to the study and also page 294.

Establishing the need for a humanistic theoretical framework

Radiography research is predominantly focussed on the technical aspects of radiography leading to the creation of a body of knowledge that is largely technical, uni-dimensional and quantified. Physicists and clinicians tended to have control over research into radiography (Hammick, 1995; Smith and Lewis, 2002; Adams and Smith, 2003) and as natural scientists they tended to support ‘...positivistic and hypothetico-deductive paradigms’ (Hammick, 1995, p. 137). The traditional positivistic theory of science was influenced by the work of David Hume, an 18th century philosopher (DePoy and Gitlin, 1998). Supporters of this epistemological view believe that the world is objectively knowable, with a single reality that may be uncovered by reducing this reality into its parts, a concept that has become known as reductionism (DePoy and Gitlin, 1998). The positivistic paradigm has predominated radiographic research (Ng and White, 2005) which may account for why the majority of radiographic literature tends to report the highly technical aspects of the field and overlook the humanistic dimension of the ethical challenges associated with interpretation and disclosure.

Positivist research is based on making objective observations, measurements and recordings which are then analysed to produce a quantified set of results (Gerber, 1999). This has been well suited to the technical aspects of the field of radiography that are examinable through scientific enquiry (Niemi and Paasivaara, 2007). Despite the dominance of positivism in radiographic research, the knowledge and practices of radiography also draw upon a background of humanistic knowledge that extends beyond the technical knowledge. Although radiographic knowledge is based on the techniques and theories that have resulted from scientific research (Hall and Davis, 1999), radiographers operate within a complex clinical environment (Lewis, 2003). The implications of a positivist background for radiography research are that, in only measuring the measurable, areas of radiographic practice may remain invisible (Koch, 1998b) resulting in gaps in radiography knowledge.

Radiography is not just about technical skills because technical expertise is always embedded within a context of meaning (Hall and Davis, 1999). As a profession, radiography takes place at the interface between technology and people (Hammick,

1995) and as such is a humanistic endeavour (Tress, 1991). The clinical practice of rural radiographers, which sees them performing radiographic examinations on people, is based on the historical development of their role, augmented by knowledge provided by both their work environment and the shared wisdom of experienced radiographers (Decker and Iphofen, 2005). The positivist paradigm seeks to explain or predict participants' behaviour, whereas this study requires an interpretative understanding which allows access to the meaning of the participants' experience (Ajjawi and Higgs, 2007). Positivism was therefore inadequate for advancing the aims of this study, which were to capture the ways in which rural radiographers understand their responsibilities relating to the interpretation of radiographic images, communication and disclosure of their radiographic opinion, and determine how this understanding informs contemporary radiographic practice.

In order to generate substantive theoretical insights into the practice world of rural radiographers, an alternative theoretical framework to positivism was required. The review of the field literature relating to rural radiographic practice identified gaps in knowledge of radiographic interpretation by radiographers and the subsequent communication with referrers and disclosure of their radiographic opinion to patients. The knowledge that working professionals use to inform their judgements, which is embedded within their performance, contains many differences from the public, technical knowledge that forms the base of their profession (Eraut, 1994). Radiography may be technically based and outcome driven, but it is nonetheless a social world (Hammick, 1995). It is a world that is interactive and formed by '...communication and perspective...' (Lewis, 2003, p. 125). Knowledge about the rural radiographer's practice world is sought in this study and this is embedded in a world of meaning and of human interactions (Ajjawi and Higgs, 2007) where the social practices of radiography are culturally and historically informed (Barley, 1986; Decker, 2006; Baird, 2008).

The hidden aspects of radiographic interpretation, communication and disclosure by rural radiographers are context bound and socially and culturally shaped as they are transferred through social action and interaction. For this reason, a theoretical framework that supported the capture and interpretation of qualitative data was required to examine these human dimensions of radiographic practice. It is this type of theory that provides important insight to contribute to the field knowledge informing

professionals, educational and policy decisions relating to radiographers' scope of practice to better prepare them for the complex and ambiguous demands of radiographic interpretation, communication and disclosure. It was therefore necessary to employ a methodology that would enable an in-depth exploration in order to achieve the research purpose of generating substantive theory of rural radiography and rural radiographers' experience of communication and disclosure of their radiographic opinion and so begin to address the gaps. The following section outlines the theoretical framework that was used to make sense of the socially and culturally shaped understandings that rural radiographers have of radiographic interpretation, communication and disclosure.

A theoretical framework for examining the social and cultural nature of rural radiographic practice

The social nature of radiography is evidenced by the collaboration between radiographers and others (Ahonen, 2008), with the 'others' consisting of, but not confined to, patients, referrers, medical staff and fellow radiographers. The radiographer/patient relationship is a particularly important foundation of radiographic practice (Bowman, 1993) and, while the radiographer/patient encounter is generally brief (Dowd, 1992; Bowman, 1993), it is also complex and dynamic (Bowman, 1993) occurring at what is often critical time in a patient's life (Murphy, 2001). The nature of this relationship and the environment in which it takes place means that radiographers continually reflect on and evaluate their behaviour and modify their practice as appropriate in respect to this evaluation (Bowman, 1993). This suggests that radiographic practices continually evolve as individuals consider and adjust their day to day practices as radiographers and patients interact within the radiographic environment. Radiographers and patients act towards each other and the radiographic environment based upon the meanings generated from these interactions, which are not fixed but are the results of co-construction which for any given situation arise from the relationships and the development of shared meaning between the participants (Guillemin, 2000). Knowledge and meaning arise as a result of the social exchange and engagement that takes place within the social world (King and Horrocks, 2010).

Radiographers are exposed to a 'symbiotic growth of understanding' (Allbutt, 2011, p. 13) as they acquire radiographic knowledge from each other to their mutual

benefit and where the acquiring of knowledge is a continuous process (Pang, 1999). Socialisation ‘...is the process by which persons acquire the knowledge, skills and dispositions that make them more or less able members of their society’ (Brim, 1976, p. 3). Rural radiographers achieve professional socialisation through interaction within the workplace (Ajjawi and Higgs, 2008). Education as they undertake their undergraduate degree, and the socialisation that occurs during the training and then working as a radiographer, reinforces the common values, language and problem solving skills of radiography (Hall, 2005). Radiography students, for example, construct the knowledge necessary for professional practice as they reconcile university based education with the practicalities of clinical experience (Baird, 2008) during clinical placement, undertaking their NPDP and as a graduate in the radiography workforce. Radiography students and new graduates adapt their university based knowledge to fit the specifics of their work environment through socialisation, and that knowledge shifts from general to being both specialised and complex (Weidman et al., 2001). Sociability that is based on such interactions and communication between radiographers, their fellow healthcare professionals and patients, is then central to radiography (Ahonen, 2008).

It is through socialisation that rural radiographers acquire their culture (Burr, 2003). Every culture and situation within a culture is more than a collection of components. A culture is comprised of a complex of meanings which are synthesised into an overall pattern (Spradley, 1980). Culture is the source of human thought and behaviour (Crotty, 1998), with each healthcare profession having its own social heritage, values, beliefs, attitudes and behaviours that are passed on to the neophytes of that profession but remain hidden to other professions (Hall, 2005). Cultural background influences how rural radiographers make sense of a particular situation, as well as influencing the actions that are considered possible and meaningful within a given situation (Forsythe, 1993). Culture shapes not only how rural radiographers view their practice world, but also shapes what they consider to be important (Crotty, 1998). It is the culture of rural radiography that has shaped the strategies that rural radiographers adopt for communication and disclosure, the way that they frame their replies to referrers and to their patients. Cultural knowledge is therefore important to understanding rural radiography because it is culture that generates and sustains behaviour (Spradley, 1980). It is through culture that members of a group either

implicitly or explicitly⁵⁹ express the way in which members should conduct themselves in certain situations (Haegert, 2003). As a result of the implicit pathways for acquisition of cultural knowledge, there are customs and practices within a culture that remain foreign to outsiders (Haegert, 2003; Hall, 2005) and herein lies the benefit of research by a cultural insider, a practitioner/researcher⁶⁰. The emic perspective of a practitioner/researcher allows greater insight into a practitioner's practice world than a cultural outsider (Smyth and Holian, 1999; Kanuha, 2000; Coghlan and Casey, 2001). Knowledge that has been acquired through implicit pathways may be hidden from the view of a cultural outsider.

The production and reproduction of cultural knowledge around rural radiographic practice involves a complex interplay of different forms of knowledge. Learning, the process by which knowledge is acquired may be formal or informal (Eraut, 2000). Formal and informal processes for learning should not be considered as separate but as occupying either end of a continuum of learning (Eraut, 2004). Learning that is achieved through processes that occupy the formal end of the continuum may be defined as a learning situation placed within the formal domain including any of the following: '...a prescribed learning framework, an organised learning event or package, the presence of a designated teacher or trainer, the award of a qualification or credit...' (Eraut, 2000, p. 114). For Australian radiographers this formal learning now constitutes completion of one of the nine recognised university degrees. Formal learning produces explicit knowledge, where 'explicit knowledge' is the tangible and formal form of knowledge that is generally accessible and available in text books and journals (Pope et al., 2003).

Informal learning, however, is implicit, opportunistic, unintended and an unstructured form of learning (Eraut, 2004). Informal learning is largely invisible with the resultant knowledge being tacit or regarded as a component of the individual's capabilities (Eraut, 2004). While informal learning may be understood within socialisation, it is a phenomenon that '...is much broader in scope than the implicit learning normally associated with the concept of socialisation' (Eraut and Hirsh, 2007,

⁵⁹ For example, in order to maintain their national registration with AHPRA radiographers must undertake CPD.

⁶⁰ Practitioner/researcher is further discussed in chapter 4, pages 159 and 168.

p. 5). Thus the knowledge of rural radiographers is impacted upon by not only the cultural practices of the profession of radiography, but also the cultural knowledge that pervades the behaviours and beliefs of their healthcare colleagues and patients (Eraut, 2007).

The professional knowledge of rural radiographers is not independent of how it has been acquired and how it is employed (Eraut, 1994). The knowledge possessed and utilised by some rural radiographers is specific to the environment in which they work (Freckelton, 2012). Rural radiographers' professional knowledge is therefore, contextual. Professional knowledge may be considered as being comprised of two parts: technical knowledge and practical knowledge. While technical knowledge cannot be separated from practical knowledge, Oakeshott (1991) does distinguish between these two forms of knowledge. Technical knowledge is codified knowledge that may be written down, learnt from a book and applied mechanically (Oakeshott, 1991). Such technical knowledge could enable the following of strict protocols and the pushing of buttons. Practical knowledge, which may be uncodifiable, is imparted and acquired through practice (Eraut, 1985; Oakeshott, 1991). For example, in general radiography some of the skills exhibited by experienced radiographers may be acquired by novice radiographers through observation, discussion and emulation (Allbutt, 2011). Practical knowledge, furthermore, may be uncodifiable because the '...knowledge is essentially non-verbal, the tone of a voice or...the expression on a face which cannot be fully described in writing' (Eraut, 1985, p. 119). Recognising that uncodifiable, practical knowledge exists in rural radiographic practice does not imply that the written knowledge of radiographic practice is irrelevant to rural radiography, because it is the technical, mechanical components of radiographic practice that allow rural radiographers to acquire radiographic images (Eraut, 1985). Furthermore, technical knowledge may be imported into practical situations forming the foundations for practical knowledge (Eraut, 1985); hence the duality of radiography. The uncoded cultural and practical knowledge that rural radiographers acquire through their participation in the workplace is learnt through an informal pathway and so radiographers may be unaware, not only of the increase in knowledge, but also of the influence this knowledge has on their behaviour (Eraut and Hirsh, 2007).

Radiographers are engaged in the construction of their radiographic clinical practice (Decker, 2006) that is based on knowledge that has both explicit and tacit components (Pope et al., 2003). Tacit and explicit knowledge, however, should not be considered as separate but rather as two parts of the one whole (Heiberg Engel, 2008). For rural radiographers, this explicit knowledge is based on their radiographic studies and their formal radiographic qualifications, attendance at conferences and workshops and in their pursuit of CPD points in order to maintain their registration with AHPRA. Tacit knowledge is generally considered to consist of skills that have been acquired through experience (Polanyi, 1958; Pope et al., 2003). Tacit knowledge is culturally mediated and context specific. Radiographers' practical knowledge, which includes the skills and practices of rural radiography, is knowledge acquired through practice that is in turn utilised in practice (Oakeshott, 1991). Practical knowledge is acquired implicitly and generally occurs when there is no specific intention on the part of the individual to learn and furthermore the individual maybe unaware of learning taking place (Eraut, 2004). Tacit knowledge is not a single type of knowledge but is knowledge based on other knowledge and arises from not only the implicit acquisition of knowledge but also the implicit processing of knowledge (Eraut, 2004). It has been suggested that tacit knowledge is less visible than explicit knowledge, and although tacit knowledge may be seen as abstract (Insch et al., 2008), it is a practical knowledge passed on through oral culture and supported by an expertise based hierarchy (Gordon, 1988a, p. 260). The tacit and implicit work practices and knowledge of the radiographer are acquired by various symbiotic relationships among novices and experienced radiographers (Allbutt, 2011), referrers, patients and others who influence day to day rural radiographic practices such as the legal and ethical framework in which radiographers operate.

It is this tacit knowledge that may have seen the origins of radiographers' knowledge of radiographic interpretation which is an essential precursor to communication and disclosure of their radiographic opinion. The lack of discussion on communication and disclosure by Australian rural radiographers in the literature may be explained because it is not codified knowledge; it is not written down or acquired through formal pathways. For example the literature reveals that very few rural radiographers have been formally trained in radiographic image interpretation and reporting and yet their opinion is sought (Smith et al., 2009b). These findings are

supported by Hall et al (1999, p. 11) with their assertion that radiographers working in remote locations ‘have informally offered opinions for many years’⁶¹.

In order for rural radiographers to participate in interpretation, communication and disclosure, they must have developed a comprehensive knowledge of both normal and abnormal radiographic anatomy and knowledge of pathology. As outlined in the literature review and background chapters, reading radiographic images is highly complex and subject to errors and biases. Furthermore radiographic image reading does not fall within the traditional domain of Australian radiographers, and consequently the knowledge and skills necessary for reading radiographs were not typically taught in radiographer education. This suggests that rural radiographers have acquired the knowledge that is necessary for them to provide their radiographic opinion by means other than explicit pathways of knowledge. The knowledge that rural radiographers employ for communication and disclosure must have been acquired through exposure and informal routes such as the anecdotal experiences of fellow healthcare professionals (Pope et al., 2003). The implication is that this knowledge has been achieved through the pathways of tacit knowledge. Tacit knowledge, however, is difficult to codify and so measuring it is challenging (Insch et al., 2008). Eliciting information about this aspect of rural radiographic practice therefore requires a theoretical perspective that acknowledges the existence and inter-relationship that radiographers employ to navigate rural radiographic practice. Revealing information about the tacit knowledge employed by rural radiographers would also render the practice world of the rural radiographer visible to people with little or no experience of rural radiography.

Schön (1983, p. 49) argues that professional knowledge is based upon the ‘...practice implicit in the artistic, intuitive processes which some practitioners do bring to situations of uncertainty, instability, uniqueness and value conflict.’ Thereby implying that professional practice is not simply the application of theoretical knowledge but it is dependent upon knowing-in-action (which encompasses tacit knowledge) and reflection (Schön, 1983). Reflection however requires observing and

⁶¹ A possible pathway for radiographers’ acquisition of radiographic interpretation skills is outlined in the following section and provides an explanation of how radiographers may have attained the skills necessary to form a radiographic opinion. Why radiographers chose to pass on that radiographic opinion is explored from page 267.

reflecting on actions in order to describe the tacit knowing that is implicit in these actions (Schön, 1987).

Reflection and reflective practice are now being incorporated into undergraduate and postgraduate education across a number of health care professions (Mann et al, 2009) and at least one Australian undergraduate radiography curriculum (Baird, 2008). However, the origins of the skills radiographers employ for radiographic interpretation, communication and disclosure was not evident in the field literature; therefore it is not possible to say with any certainty whether these skills have been achieved through reflective practice. Monash, an Australian university uses a clinical assessment tool congruent with Dreyfus and Dreyfus model of skill development to assess radiography students in their clinical placements (Baird, 2008). As such this is a tool used to assess radiography students as they learn within the clinical world of the radiographer. Therefore it is proposed for this study that rural radiographers' acquisition of the comprehensive knowledge of both normal and abnormal radiographic anatomy and knowledge of pathology necessary for radiographic interpretation may be understood using a model for understanding the acquisition of skill devised by Dreyfus and Dreyfus. Through their study of skill acquisition, Dreyfus and Dreyfus formulated a five stages model of skill acquisition from noting common patterns in their studies of airplane pilots, chess players, automobile drivers and adult learners of a second language (Dreyfus and Dreyfus, 1986). Patricia Benner adapted this model for her studies into the acquisition of nursing skills with the five stages being novice, advanced beginner, competent, proficient and expert (Benner, 1984; Dreyfus and Dreyfus, 1986). This model demonstrates how an individual, when confronted with a new situation, over time progresses through the levels of proficiency, generally commencing at the novice stage, with talented individuals acquiring the skill levels and the cognitive process necessary for moving towards the expert level of proficiency (Dreyfus and Dreyfus, 1996).

The potential pathway for the acquisition of implicit knowledge of radiographic interpretation by an informal route between an expert and a novice can be seen in the following quotation.

Think of a medical student attending a course in the X-ray diagnosis of pulmonary disease. He watches in a darkened room shadowy traces on a fluorescent screen placed against a patient's chest, and hears the radiologist commenting to his assistants, in technical language, on the significant features of these shadows. At first the student is completely puzzled. For he can see in the X-ray picture of a chest only the shadows of the heart and the ribs, with a few spidery blotches between them. The experts seem to be romancing about figments of their imagination; he can see nothing that they are talking about. Then as he goes on listening for a few weeks, looking at ever new pictures of different cases, a tentative understanding will dawn on him; he will gradually forget about the ribs and begin to see the lungs. And eventually, if he perseveres intelligently, a rich panorama of significant detail will be revealed to him: of physiological variations and pathological changes, of scars, of chronic infections and signs of acute disease. He has entered a new world (Polanyi, 1958, p. 101).

Polanyi's insightful portrayal of a medical student acquiring the language and understanding of pulmonary radiology is not just a metaphorical description of the journey from novice through the levels of proficiency. It is Polanyi's actual journey as he underwent training in radiology. Polanyi's tale may be seen as analogous to a radiographer's acquisition of radiographic interpretation skills. Radiography students and newly graduated radiographers enter the field as novices with limited understanding of how the explicit knowledge that they have gained through their education fits with the clinical setting (Benner, 2001). But it is not just student radiographers and those in the NPDP, but also any healthcare professional with limited experience in radiography and radiographic interpretation who could be considered a novice (Benner, 2001). Radiographic interpretation which is preceded by the detection of an abnormality on a radiographic image requires a knowledge of the normal range of appearances for the anatomic area under review (Hare, 2007).

Radiographers acquire this knowledge of 'normal' explicitly from their knowledge of radiographic anatomy and implicitly as they critique the radiographic images that they produce for positioning and technical accuracy. The vast number of images they evaluate throughout their career leads to radiographers acquiring perceptual knowledge (Donovan and Manning, 2006). As a result of this perceptual knowledge, radiographers may recognise a radiographic abnormality because it is knowledge and experience that determine the probabilities that will come to the mind of the observer when viewing an abnormality on a radiographic image (Hare, 2007). A premise central

to the theory of tacit knowledge is that experts and novices are distinguished by their levels of tacit knowledge (Pope et al., 2003). As radiographers progress through the levels of proficiency, they develop a mastery of radiography, but until they become proficient they still require deliberate and conscious planning in order to be efficient (Benner, 2001). Proficiency is experience based and so radiographers learn from experience what to expect in certain situations (Benner, 2001). Over time radiographers develop their understanding and knowledge of normal, normal variants and abnormal (Anderson et al., 2006). The expert radiographer does not rely on analytical principles in order to decide upon an appropriate response to a situation but rather ‘...with an enormous background of experience...has an intuitive grasp of each situation and zeroes in... on the problem...’ (Benner, 2001, p. 32). This may be seen in radiography when seniority and experience are generally associated with a radiographer’s ability to accurately diagnose radiographic abnormalities (Anderson et al., 2006). Indeed, a distinguishing feature of an expert is not how much they know, but rather their ability to utilise their knowledge (Eraut, 2004). As this knowledge has been acquired over time, the health professionals themselves are often unaware of this increase in knowledge (Benner, 1984) with the consequence that radiographers may be utilising knowledge that even they do not know they possess. Therefore it may be necessary to render the practice world of the rural radiographer visible not only to those who have little or no experience of radiography, but also to radiographers themselves.

The literature revealed that radiographers’ opinions are actively sought by referrers (Smith, 1995; Smith and Lewis, 2002; Smith, 2008; Queensland Government, 2011) and even offered by radiographers (Smith, 2008; McConnell et al., 2012). A gap exists in the knowledge surrounding radiographers’ communication with referrers. Although Ford (1992) advises that radiographers should ring the referrer, and McConnell (2012) suggests that radiographers are required to verbally discuss the presence of a radiographic abnormality on a patient’s radiographic image with the referrer, it is not known how radiographers frame communication of their radiographic opinion to referrers. Within arenas that are technical and may involve clinical decision making, it is tacit knowledge that is most likely to be used for the generation of hypotheses such as radiographic opinion, and for possible sources of action (Eraut, 2004). Therefore, tacit knowledge of the practice world of the rural radiographer must be unearthed and captured.

The literature review further revealed that patients are requesting diagnostic input from radiographers. The origin of radiographers' knowledge of what information to pass onto patients is unclear. It has been suggested that during a radiographic examination radiographers not only assess the physical condition of their patient but that they also assess the patient in order to determine their psycho-social needs (Bowman, 1993). The identification of cues has been offered as potential answers to assessing a patient's psycho-social needs (Bowman, 1993). The knowledge that people employ to read situations and other people may be consciously held, although it is rarely written down, making it uncoded, and will also be influenced by personal elements (Eraut, 1994). The assessment of a patient's psycho-social needs by a radiographer may provide them with knowledge that they then use to decide how to appropriately frame replies to the patient's questions. The assessment by a healthcare professional of a patient's competence to receive information is not quantifiable. Although it may benefit from provision of a guiding framework, it may just be that it requires intuition (Fulbrook, 1994). The '...knowledge of a person is normally constructed in a manner that is largely intuitive...' (Eraut, 1994, p. 78). A response that is based on intuition is automatic and implicit; it is not the subject of guessing but rather is based on considerable experience (Gordon, 1988a). Furthermore, decisions made by healthcare professionals as to how information should be related may be influenced by the cultural and societal values that are embedded within the healthcare system (Pang, 1999), suggesting that rural radiographers' replies to their patients may also be governed by the culture and values of their working environment. While coded and uncoded knowledge are acquired and employed in social contexts, '...different people experience a different range of situations; and this may lead to them giving slightly or widely different meanings' (Eraut and Hirsh, 2007, p. 6). The knowledge that radiographers employ in their practice world is constructed through experience, and how that cumulative knowledge is manifested is dependent upon radiographers' selection and interpretation of that experience (Eraut, 1994). Rural radiographers' knowledge is therefore, socially constructed (Stake, 2003).

The social construction of rural radiographic practice

Drawing together the threads of the history, culture and the contextually bound nature of radiography shows that it is appropriate to view rural radiography within a social constructionist framework. Social constructionism recognises that knowledge is historically and culturally located (King and Horrocks, 2010). Social constructionism makes use of a term borrowed from philosophy, sociology and psychology. It is a theoretical perspective that has its origins in the work of 18th and 19th century German philosophers (Crotty, 1998). Derived from sociology of knowledge as introduced to the English speaking world by Karl Mannheim (Berger and Luckman, 1966), the concept of social constructionism is more recently attributed to the writing of Kenneth Gergen along with the text by Berger and Luckman (Berger and Luckman, 1966). Berger and Luckman devised a philosophical framework for explaining ‘...how particular human behavioural patterns arise over a period of time in a particular setting’ (Carroll et al., 2008, p. 205).

Social constructionism is an epistemological paradigm where the basic premise is that knowledge and meaning are not discovered but are social constructs that evolve as a consequence of discourse amongst a social group (Berger and Luckman, 1966; Crotty, 1998; Burr, 2003; Schwandt, 2003; White, 2004; Whiting, 2007). Constructionism is incorporated into many theoretical perspectives (Crotty, 1998) and human inquiry within a social constructionist framework therefore follows a number of theoretical and philosophical assumptions. Social constructionism is associated with post-modern philosophies (Hutzler and Sherrill, 2007; Whiting, 2007) and so, as a theoretical perspective, it offers a different orientation to knowledge and the nature of knowledge (White, 2004). ‘A social constructionist position in any discipline assumes that entities we normally call reality, knowledge, thoughts, facts, texts, selves and so on are constructs generated by communities of likeminded peers’ (Bruffee, 1986, p.774). The realities of rural radiographic practice are therefore socially constructed, shaped over time and change according to local circumstances (Minichiello et al., 1999a), such as working in a rural community as opposed to the urban context. In his paper outlining the introduction of new CT scanners and the social order of radiology departments, Barley writes ‘...technical uncertainty and complexity are social constructions that vary

from setting to setting even when identical technologies are deployed' (Barley, 1986, p. 106). The rationale behind defining time and place is because a researcher in social constructionism also focuses '...on the specific contexts in which people live and work in order to understand the historical and cultural settings of the participants' (Creswell, 2003, p. 8). From this, it is possible to see that meanings associated with the rural radiographic practices' construct does not just mirror an individual's perception but rather are socially shared constructions based on a complex historical, cultural and contextual background. The 'social' in social constructionism refers to the mode in which meaning has been generated (Crotty, 1998). In the context of this study this refers to the world constructed of meaning by radiographers' interactions with others in radiographic practice within the context of rural practice.

Rural radiographers have a shared reality, world, tradition and language and as such they live within a world that they themselves help to construct. Constructions are not developed in isolation but rather amidst an environment of the shared experience of practice, language and understanding (Schwandt, 2003). The language that is used within individual professions includes terms and meanings unique to that profession (Decker and Iphofen, 2005). For radiography this language includes the terms used to denote the radiographic equipment, projections techniques and protocols that contribute to the world of the rural radiographer.

Shared space that allows social interaction, such as a tea room or viewing room⁶² provides radiographers with a meeting point and '...a forum for dissemination of information' (Decker and Iphofen, 2005, p. 269), a place where rural radiographers may interact with their radiographic and healthcare colleagues and discuss radiography (Smith et al , 2009b). It is a place where the art and science⁶³ of general radiography may be observed (Allbutt, 2011). It is a place where humans interact with each other and also with and within their environment to construct frameworks of meaning (White, 2004). As radiographers interact, they not only share knowledge but also create

⁶² A viewing room is an area within a medical imaging department where radiographs are collated by radiographers prior to dissemination. The viewing room also constitutes an area referred to by Murphy (2009) as backstage. Front stage are those areas within an imaging department where patients and visitors are present (ibid.); conversely backstage are areas of restricted access to patients.

⁶³ Gordon uses a metaphorical representation of clinical knowledge by describing it as 'art' and 'science' (Gordon, D. R. 1988a). The relationship between the two metaphors may be portrayed as one learns 'science' and it is then in application of the 'science' to patient care that 'art' comes into play (ibid).

knowledge (Whiting, 2007). The meanings attributed to the world of the radiographer arise from these interactions (Blumer, 1969), so that each radiographer will, on the basis of past experience, interpret a situation in different ways (Polgar and Thomas, 1998). Radiographic practices are socially constructed; more specifically, the radiographic profession is constructed around the operational role of radiographers within a dynamic work environment and within a continually evolving healthcare system (Decker, 2006). Rural radiographers' construct of their practice world is not limited to their operational role. The rules and customs of a society are also passed from generation to generation (Beauchamp and McCullough, 1984) with the result that people within a common cultural and historical context share a 'common morality' (Beauchamp and Childress, 2001, p. 3, Johnstone, 2009) such as radiographers operating within rural radiographic practice. The culturally informed tacit knowledge of the rules and customs that exist in the practice world of the rural radiographer may be used by rural radiographers to inform their practices and decision making. For this reason it was necessary to consider ethical theories in understanding the practice world of the rural radiographer.

The use and value of ethical theories for examining rural radiography

The five stages model of skill acquisition formulated by Dreyfus and Dreyfus has been used to understand the radiographer's acquisition of knowledge and skill in radiographic interpretation. The pathway for skill acquisition for radiographers is not limited to radiographic interpretation. Another kind of expertise applicable to rural radiography is a mastery of ethics. In a field such as radiography where care for the patient is central, '...it is difficult, if not impossible, to have encounters that do not encompass both clinical and ethical expertise...' (Dreyfus et al., 1996 , p. 259).

Ethics and morality are not abstract philosophical concepts or simply professional codes of practice (Beauchamp and McCullough, 1984). The ethics of a profession encompass the moral obligations that result from the activities in which the professionals are engaged (Pellegrino and Thomasma, 1993). Moral beliefs are often transmitted implicitly within customs and practices, even though moral education is an explicit component of medical education (Beauchamp and McCullough, 1984). Rural

radiographers are inducted into skilful ethical behaviour through imitation and by questioning practices, skills and theories about what is considered skilful ethical behaviour (Dreyfus et al., 1996). Ethics, however, does not take place in a cultural vacuum (Hafferty and Franks, 1994). Radiographers construct and reconstruct ethics as they interact with their professional colleagues and their patients and so the ethics of rural radiographers are shaped by ‘...a multiplicity of social forces...’ that not only combine to create but also modify ethics (Brown, 1995).

Ethical questions are prevalent in radiography (Obergfell, 1995) but, as little about ethics appears in the radiographic literature, it is a topic about which little is known. Research into values provides a pathway to understanding an individual’s reaction to a given situation (Rassin, 2008). Therefore for this study it was necessary to collect data that could be analysed in order to allow the identification of the values and rules which govern the behaviour of rural radiographers (Morse and Field, 1995). Such research will provide an understanding of rural radiographers because ‘[r]adiographers interact in a health care world where radiographic practice is a moral endeavour’ (Lewis, 2003, p. 125).

In order to explore the complex ethical dimension of the dilemmas and activities experienced by rural radiographers in relation to radiographic opinion communication and disclosure, it was necessary to identify a framework to allow understanding. Radiography draws parallels with the nursing profession (Decker and Iphofen, 2005) and so it is appropriate to turn to the nursing literature for an ethical framework to provide an understanding of rural radiography. Bioethics is a relatively modern sub-discipline of ethics (Mitchell et al., 1996). The term ‘bioethics’ has its origins in Greek with *bios* meaning life (Johnstone, 2009) and *ethos* meaning ‘character’ or ‘custom’ (Preston, 2001). In order to pursue the topic of bioethics, it is essential to have some understanding of the topic and its working in the healthcare environment. Although it has been suggested that there are eight principles of biomedical ethics (Lynn, 1999, p.259), several authors, namely Berglund (2004), Mitchell et al (1996), Tschudin (2003) and Lewis (2002), all make reference to the modern philosophers Beauchamp and Childress and various editions of their *Principles of Biomedical Ethics* and the four principle approach. It is the four principle approach that is used in the education of healthcare undergraduates (Lewis, 2003, p. 107) and medical ethics is now

a component of every undergraduate radiography course taught in Australia (Lewis, 2003). The moral principles that Beauchamp and Childress have set as the analytical framework for their model of biomedical ethics are autonomy, non-maleficence, beneficence and justice⁶⁴ (Beauchamp and Childress, 2001). According to these authors veracity, privacy, confidentiality and fidelity are moral rules and some of these rules specify one principle while others specify more than one principle.

The Principles of Biomedical Ethics model offers a process by which to make ethical decisions based on negotiations between the fundamental principles (McCarthy, 2003). Furthermore, the four principle approach as initially developed by Beauchamp and Childress and adopted by others ‘...provides a coherent approach for exploration and analysis of ethical issues in healthcare’ Mitchell et al. (1996, p.46). While there are difficulties with its use, what the four principle approach may provide in individual cases is a tool for travelling through moral territory so that morally relevant details may be recognised and used as a basis for ethical discourse (Holm, 1995). Using ethical theories, this thesis will interpret the meanings that emerge from this study of rural radiographic practices which are socially, culturally and historically mediated by the rural context.

Clearly there is an ethical component to rural radiographers’ communication with referrers and disclosure to patients, but it has been identified that some of the radiographers had difficulty with the comprehension of some ethical concepts and terminology (Lewis, 2002, p.155). This difficulty throws into doubt the appropriateness of a direct approach. It would not advance the intent of this thesis to ask radiographers about their ethical decision making processes if the language of ethics is foreign to

⁶⁴ Each of the principles of biomedical ethics is described in turn in the following section. Autonomy is a person’s right to make their own decisions with the proviso that the consequences of these decisions do not violate another’s autonomy (Lewins, 1996, p. 22), where the ‘autonomous individual acts freely in accordance with a self-chosen plan ...’ (Beauchamp & Childress, 2001, p.58). Autonomy is the central concept to bioethics and confidentiality and veracity are derivatives of autonomy (Lewins, 1996, p.26). Non-maleficence is the duty to avoid harm to others, whereas beneficence is the obligation to do good, and accordingly there exists an obligation not to inflict harm and to contribute to their wellbeing (Lynn, 1999, p.259). But it should be noted that ‘...principles of beneficence potentially demand more than the principle of non-maleficence because agents must take positive steps to help others, not merely refrain from harmful acts’ (Beauchamp & Childress 2001, p. 165). Justice is revealed by Lynn (1999, p.259) to mean that individuals must be treated fairly, lawfully and that the interpretation may extend to equal distribution of benefits. Further to this point Mitchell et al. (1996, p. 114) write that justice goes ‘...beyond the laws which govern any society, there are standards and social mores which suggest that people should live up to their obligations to one another’.

them. However radiographers are involved in aspects of practice such as radiographic interpretation, communication and disclosure that are ethical and so it is appropriate to look at rural radiographers' radiographic practice through an ethical perspective rather than questioning them directly on their ethical standing.

Discussions around ethics cannot be understood without also understanding the situations in which they are supposed to apply (Jameton and Fowler, 1989). Rural location impacts on health professionals by shaping their working environment and this emphasises the importance of context when considering the practice of rural radiography (Huntley 1991; Rourke 1997). The literature has shown how the rural context increases the challenges radiographers face when they communicate their opinion to referrers and patients who may be family or friends and how ethical considerations are integral to disclosure.

Rural radiographic practice is contextually bound; what is meaningful is dependent upon the situation. Radiography is based on knowledge about the technical and physical components of radiographic procedures and also knowledge from the perspective of those who experience the world of radiography (Hammick, 1995). In this study it was necessary to turn the focus from the quantifiable to a social and historical standing of radiography to reveal the '...hidden cultural scaffolding and social processes that shape knowledge and practice' (Gordon, 1988b, p. 20). Understanding is situated within context and necessitates access to the contextual issues of rural radiography because '...jobs and rightness are themselves constructed and are given meaning through the relations in which they exist and within the networks in which they operate' (Guillemin, 2000, p. 453).

Radiographic practice combines medical and scientific knowledge which are social and cultural (Gordon, 1988b). Therefore, the way in which radiographers respond when faced with the issues surrounding radiographic interpretation and disclosure is culturally, socially and historically informed. One way to understand the social practice of rural radiography is from the perspective of a rural radiographer and research within the social sciences has established that qualitative methodologies are most useful for this endeavour. Furthermore, qualitative research allows for recognition of the socially constructed nature of rural radiography (Denzin and Lincoln, 2003). There is a wealth

of knowledge to be found in the experiences of rural radiographers because the social world of rural radiography may be inferred from the words and actions of the rural radiographers themselves (Wolcott, 1987). Language, spoken or written is ‘...intimately connected tosocial practices that have a profound effect on how we live our lives, on what we can do...’ (Burr, 2003). Therefore knowledge both explicit and tacit may be revealed through speech (Spradley, 1980). In addition, experiential learning is best captured through accounts by rural radiographers themselves (Benner et al., 1999). This makes it appropriate for these dimensions of radiographic practice to be examined by techniques such as interviews and questionnaires that will provide rich descriptions of the experiences, perceptions and meanings of the participants (Williamson, 2006) in order to describe and also interpret the practice world of the rural radiographer. Capturing radiographers’ accounts of their experience of rural radiographic practice, radiographic interpretation, communication and disclosure of their radiographic opinion may be considered to share the same characteristics as a written account and so may be considered as a literary text (Ricoeur, 1973; Skjorshammer, 2002). By capturing radiographers’ accounts through qualitative research methods such as interviews, and transcribing their responses as text, the transcripts became the text for analysis (Geertz, 1973).

Radiographers’ accounts present a way of learning and knowing, and allow for the examining and interpreting of human action (Skjorshammer, 2002). An individual’s accumulated memories of cases and episodic events are influenced by their perspectives, values and interpretations which have been shaped by their workplace culture, and their conscious and semi-conscious learning from and with their workplace colleagues as they work together to resolve workplace challenges (Eraut, 2004).

Just as accounts by nurses may make nursing practice visible (Koch, 1998b), so may accounts by rural radiographers make rural radiographic practice visible by exploring the meanings that radiographers socially construct about rural practices.

Summary

In the past the knowledge base for radiography has been largely based on positivist research, which has resulted in key areas of rural radiographic practice such as radiographic interpretation, communication and disclosure remaining invisible to those with little or no experience of rural radiographic practice. To apply a traditional framework for radiography research where measurement, prediction and causal inference is the overarching paradigm, would not provide insight into the way in which radiographers understand their responsibilities in relation to radiographic image interpretation, communication and disclosure of their radiographic opinion⁶⁵. Rural radiographers' professional knowledge combines technical and practical knowledge. Technical knowledge is explicit knowledge acquired through formal learning pathways. Practical knowledge which is acquired through implicit pathways incorporates tacit knowledge. Tacit knowledge is the less visible form of knowledge and so may not be recognised by those who operate outside rural radiographic practice, but also by rural radiographers themselves. Practical knowledge is imparted and acquired through practices which are social and cultural. Therefore, the way in which radiographers respond when faced with the issues surrounding radiographic interpretation and disclosure is socially, culturally and historically informed, and so it is necessary to explore these dimensions of radiographic practice using techniques such as interviews and questionnaires that will provide rich descriptions of the experiences, perceptions and meanings of the participants. The next chapter presents the research design and methods which were employed to elicit data that will enable an authentic account of the rural radiographer's world to be described.

⁶⁵ Discussion around why this study required other than the traditional positivistic paradigm that has predominated radiographic research commences on page 104.

Chapter 4: Research Methods

Introduction

Chapter 3 discussed the way that radiographic practice is constructed by radiographers on the basis of the historical and cultural nature of radiography and passed on through a process of socialisation. The practice world of rural radiographers, which is based on a biomedical framework and contemporary moral and ethical perspectives, is constructed around the socialisation of radiographers with their professional colleagues and also their patients. As a practice, radiography combines medical and scientific knowledge which are social products and as a consequence must be examined by tools of social analysis (Wright, 1988). It is therefore necessary to collect data that can be analysed to allow the identification of the values and rules which govern the behaviour of rural radiographers (Morse and Field, 1995) to unearth rural radiographers' construction of ethics. A social constructionist viewpoint determines both the way in which research progresses and how the data is viewed (Crotty, 1998). Data collection techniques that are suited to the constructionist framework include questionnaires and interviews as these allow the researcher to elicit perceptions and to provide rich descriptions as the meanings and experiences of participants are unearthed (Williamson, 2006). In this study two data collection techniques were used, namely a paper-based questionnaire and semi-structured individual interviews as both of these methods are useful for learning from rural radiographers, for describing and interpreting cultural behaviour, and also for identifying the complexities that underlie a culture (Morse and Field, 1995).

Rural radiographers' patterns of communication and disclosure are not only shaped by culture, but rather they are 'constructed' and 'reconstructed' as a consequence of the socio-historical setting in which rural radiography occurs (Lupton, 2003). In order to provide insight into the context-bound and culturally and socially shaped practice world of the rural radiographer, the qualitative data for this study was analysed using thematic analysis to identify the 'semantic relationships' and to identify the 'cognitive principles' that form part of the practice world of rural radiography (Spradley, 1980, p. 144). The aims of this study included capturing the ways in which rural radiographers understand their responsibilities relating to the interpretation of

radiographic images, communication and disclosure of their radiographic opinion and to determine how this understanding informs contemporary radiographic practice. This may be achieved by describing aspects of the practice world of rural radiography. A statement of how the members of the group under study act and believe they should act, does not exist until a researcher makes that statement (Wolcott, 1987).

While chapter 3 outlined the theoretical framework that links the lines of inquiry that emerged from the literature review into an overarching qualitative research framework of social constructionism, this chapter outlines the methods used for the collection and analysis of the data. It discusses the progression of the study through the research design (specifically revealing the data sources, sampling method, process of data interpretation and analysis) and demonstrates how the practical methods of the data collection and analysis fit within the social constructionist framework of this study. This chapter is presented in stages that reflect the progression of the study. It steps through the two phases of the study in turn and reveals how the data collected from the questionnaires provided a demographic profile of the respondent rural radiographers and revealed patterns of radiographic service delivery along with a summary of the issues and practices around radiographic interpretation, communication and disclosure of radiographic opinion. The data provided by the questionnaire was then enhanced by the qualitative data collected from the interviews.

Research Design

The study, which had a two phase, exploratory interpretive design, employed two data collection techniques⁶⁶. These were chosen in order to provide the depth and range of data necessary to answer the research questions. The first phase of the study gathered information from radiographers currently practising in rural areas and employed a paper-based questionnaire. The questionnaire was only a minor data collection instrument for this study. The purpose of the questionnaire was to provide descriptive data of the rural radiographer population along with information surrounding radiographic interpretation, communication and disclosure of radiographic opinion and also to provide initial lines of inquiry for the interviews. Purposive sampling was

⁶⁶ A flowchart outlining the research design is included as Appendix E.

employed for the distribution of the questionnaire with the questionnaire being distributed to cohorts of rural radiographers from New South Wales, Western Australia and Tasmania. The data collected included demographic details, geographical location, preparation for rural practice, patterns of service delivery and identification of issues surrounding communication and disclosure of radiographic opinion. The analysis of the data collected from the returned completed questionnaires, because it contained both quantitative and qualitative components, was assisted through SPSS® for MS Windows Version 15.0 (2006) for Windows software and QSR NVivo 8®. The data analysis assisted through SPSS® mostly involved frequencies which summarised information about one variable relative to the total number of cases and the results are presented as percentages. The analysis of the questionnaire data also involved generating some information about bivariate relationships and this was facilitated through the SPSS® function crosstabs. The answers to the open ended questions and questions with probes that allowed for free text replies were analysed using thematic analysis with QSR NVivo 8® used to manage the coded data. The results of the data analysis from the questionnaire are reported in chapters 4, 5 and 6 and Appendix F.

Following the analysis of the questionnaire data, the second phase of the data collection, which involved in depth semi-structured interviews with nine rural radiographers, was conducted. The interviews which were conducted either face to face or by telephone were the main data collection technique for this study. The purpose of the interviews was to gather information about radiographic interpretation, communication with referrers and disclosure of radiographic opinion at a deeper level than is possible through a questionnaire. The interviews with the participants, who were also from New South Wales, Western Australia and Tasmania, took place between August 2008 and May 2010. In order to understand how rural radiographers experience, interpret and understand radiographic interpretation, communication with referrers and disclosure of their radiographic opinion to patients, the qualitative interview transcripts were analysed using thematic analysis techniques assisted by QSR NVivo 8® to code data and organise the emergent themes. The results from the analysis of the interview data are also reported in chapters 5 and 6 of this thesis.

This study combined not only two data collection techniques but also combined two data collection paradigms. The first data collection technique employed, the

questionnaire, traditionally sits within the quantitative paradigm, although in this study the questionnaire also contained some questions that allowed free text replies that have introduced a qualitative component into the questionnaire. The second data collection technique, interviews, traditionally sits within the qualitative paradigm.

Epistemological assumptions about the value of knowledge differ between quantitative and qualitative research (Benzies and Allen, 2001). There is, however rarely a rule of descent from epistemology to method (Johnson and Onwuegbuzie, 2004). An epistemological stance does not prevent a qualitative researcher from adopting data collection methods typically found within quantitative research (Johnson and Onwuegbuzie, 2004). So although qualitative and quantitative research methods have developed from different paradigms (Sale et al., 2002; Johnson and Onwuegbuzie, 2004) and have no standard of comparison (Sale et al., 2002), methods can be combined within a single study because each method will study a different phenomenon. The questionnaire data provided not only a demographic snapshot of rural radiographers but also supported the findings from the literature review that suggested that rural radiographers are engaged in radiographic interpretation, communication and disclosure of their radiographic opinion.

While two research methods were employed this study should not be considered mixed methods. A study is only mixed methods when there is an integration of the quantitative and qualitative approaches across the stages of the study (Teddlie and Tashakkori, 2009, Creswell and Plano Clark, 2007, Onwuegbuzie and Johnson, 2006). In this study there has been no integration of the two sets of findings. Confusingly studies that are not mixed method; that is there is no integration of the findings, but in which two types of data are collected may be referred to as quasi-mixed designs (Teddlie and Tashakkori, 2009) The findings from the questionnaire have been used to provide demographic data on rural radiographers and to inform the qualitative component of the study. Whilst some of the findings from the questionnaire have been reported alongside the interview data in chapters 5 and 6, the intention is for the questionnaire data to provide a point of comparison for the interview data. So although the quantitative and qualitative components of the study were conducted sequentially the resultant data has not been mixed at the data interpretation stage of the study as would be necessary for even a partially mixed methods study (Leech and Onwuegbuzie, 2009).

The second stage of the study, which was contingent upon the first, comprised semi-structured interviews again with radiographers providing radiographic services in rural areas. The rationale for the use of semi-structured interviews in this study was that it is not possible to know all the appropriate questions to ask because some of the questions and the answers emerged from the dialogue (Minichiello et al., 1999b; Gerson and Horowitz, 2002). Furthermore an iterative process was utilised so that, as an issue that appeared to provide understanding of rural radiographic practice was raised at one interview, it became the basis for a question in subsequent interviews. The result of the combined use of quantitative and qualitative methods has therefore added depth, not only to the data collected, but also to the theory development in this study into aspects of the practice world of the rural radiographers by increasing the depth and breadth of knowledge available (Benzies and Allen, 2001).

Some of the findings from the questionnaire have been reported in this chapter and as Appendix F, but the majority of the questionnaire data has been reported alongside the interview data in chapters 5 and 6. Pertinent literature has also been integrated throughout the findings chapters to provide an additional point of comparison. The use of multiple techniques along with theoretical concepts allows for the validation of text; however, where only one or two techniques are employed, such as in this study, ‘...it is very important to also use the literature to provide support for the findings’ (Williamson, 2006, p. 89).

Study set up

Ethical considerations

In Tasmania the ethical review of research that involves humans or data about humans is undertaken by the Human Research Ethics Committee (Tasmania) Network on behalf of the Tasmanian Government Department of Health and Human Services and the University of Tasmania. The research protocol for this study was approved by the Tasmanian Social Sciences HREC Ethics Committee on 22 December 2006. The Full Committee Application Approval was awarded a reference number of H9204 (Appendix G). Approval necessitated compliance with the *National Statement on the Ethical Conduct in Research Involving Humans 1999* and consequently the researcher operated within the parameters outlined in the research ethics approval with regard to anonymity,

confidentiality and informed consent by the study participants. The obligations for notification of changes and annual reporting to the Tasmanian Social Sciences HREC Ethics Committee were also met. Confidentiality for participants in both the questionnaire and interview components of the study was guaranteed through non-collection of identifying data or by de-identifying data at its collection point. For example the questionnaires were returned anonymously and only the state of Australia to which the questionnaire had been sent could be identified. Each questionnaire participant was provided with a questionnaire pack that contained an invitation to participate in the study⁶⁷, two self-addressed return envelopes and a separate contact details page⁶⁸ inviting respondents to provide contact details if they agreed to participate in interviews. The returned hard copies of the participant completed questionnaires, consent forms and contact details forms were securely stored in a locked cupboard. Prior to commencing the face to face interviews the participants were provided with the information sheet⁶⁹ and a consent form⁷⁰ which was handed to them by the researcher and they were then allowed the time to read both sheets. The information sheet and consent forms were emailed to the participants for the telephone interviews several days prior to the scheduled interview. These approaches ensured that each participant understood the aims of the project and was aware of their right to withdraw from the project at any stage. This approach also ensured that each participant was aware that there would not be any disclosure of their identity as a participant in the study, and that any data reported in the thesis or any subsequent publications arising out of the study would be reported in a fashion that preserves their anonymity (whether by way of pseudonym for persons and places or by generalising its content). Prior to signing the consent form or verbally consenting to the interview, each participant was asked if they had any questions. Any questions posed by the informants were truthfully answered by the researcher; all the participants signed the consent form or provided verbal consent which was recorded in their interview transcript. None of the participants refused to proceed nor did any of them withdraw consent once the interviews had begun or at any time afterwards. In an attempt to further support confidentiality, the interviews that were conducted by telephone were at a time and place negotiated by the participant. All the interview participants were advised at the time of scheduling the interviews that it

⁶⁷ A copy of the Invitation to participate in the questionnaire is provided as Appendix H.

⁶⁸ A copy of the Contact Details form is included as Appendix I.

⁶⁹ A copy of the Information Sheet for Interviews is included as Appendix J.

⁷⁰ A copy of the Consent form for Interviews is included as Appendix K.

was best for their venue to be both private and quiet. The researcher was mindful that the complex relationships that exist in a small town mean that confidentiality is an issue⁷¹ (Sigsby, 1991; Rourke, 1997; Cook et al., 2001; Dalton et al., 2002) and so the participants were given the freedom to choose the venue at their end and so had control over who was aware of the interview taking place. None of the information regarding time, date or venue was divulged by the researcher. During telephone interviews the researcher was alone in a private room.

The digital recording of each interview was downloaded on to the university-provided and password protected laptop. The audio file of each interview was then deleted from the digital recorder. The interviews were transcribed verbatim and any identifying data removed from the transcript. Participants' names were replaced by a pseudonym and the names of Australian towns and cities replaced by their appropriate Rural, Remote and Metropolitan Areas (RRMA) classification. The recording from each interview was renamed according to the chronological order in which each interview took place so that the first interview undertaken became known as interview 1 and so on. The participants for the interviews were similarly assigned pseudonyms so that the rural radiographer who provided the first interview became RR1. The transcripts of the interviews were also stored in a password protected computer and remained available only to the researcher. All collected data will be kept for five years post degree conferral and then deleted or shredded as appropriate.

Study Setting

This study into the practice world of the rural radiographer necessitated defining both 'rural' and 'radiographer'. The task of defining rural has been consistently challenging researchers due to the number of definitions of rural⁷². Internationally, there is no agreed definition of rural (Hays, 1999, Wilson et al., 2009). For this study, providing radiographic services to a population of less than 100,000 which corresponds to the

⁷¹ Discussion regarding the impact of the researcher being a rural radiographer is provided on pages 159-162 and 168-170.

⁷² Many developed nations have complex classification systems used to define rurality based on distance to major population centres, population and density of population (Hays, R. B. 1999). Australia is no exception and there are three major geographical remoteness classifications in current use in Australia: RRMA (Rural, Remote and Metropolitan Areas), ARIA (Accessibility/Remoteness Index of Australia) and ASGC (Australian Standard Geographical Classification) (Australian Institute of Health and Welfare 2004).

RRMA classification of R1 to Rem 2 was used to define rurality (Australian Institute of Health and Welfare, 2004).

<u>Zone</u>		<u>Category</u>
Metropolitan	M1	Capital Cities
	M2	Other metropolitan centres (urban population > 100,000)
Rural	R1	Large rural centres (urban centre population 25,000–99,999)
	R2	small rural centres (urban centre population 10,000–24,999)
	R3	other rural areas (urban centre population < 10 000)
Remote	Rem1	remote centres (urban centre population > 4,999)
	Rem2	other remote areas (urban centre population < 5,000)

Table 2: RRMA classifications (Australian Institute of Health and Welfare, 2004)

The RRMA classification of remoteness was chosen because it defines rural and remote by the population of a centre and not by its geographical location⁷³. The RRMA classification was developed in 1994 by the Department of Primary Industries and Energy and the Department of Human Services and Health (Australian Institute of Health and Welfare, 2004). The RRMA classification consists of three zones, namely metropolitan, rural and remote, where all metropolitan centres with a population of 100,000 or more are allocated to the metropolitan zone. This classification system employs seven categories, two metropolitan, three rural and two remote (Australian Institute of Health and Welfare, 2004).

⁷³ Use of other classification systems such as ARIA and ASGC would have required collecting postcode or town name data. Furthermore ASGC boundaries may cross a postcode (Australian Institute of Health and Welfare 2004). Use of postcode or town name may have identified a respondent in the case of smaller radiology departments and particularly in the case of sole operators. The other option of providing a comprehensive list of locations and for respondents to then identify their town and then transcribe remoteness classification onto the questionnaire was considered to be unwieldy and time consuming for the participants.

In addition to defining the term ‘rural’ in this study, it was equally important to define ‘radiographer’. Such clarity was necessary, because as was revealed in chapter 1, there is not one common academic radiographic qualification that could be used to define a radiographer. Also, at the time of data collection for this study, national registration of Australian radiographers had not been enacted. The Australian Institute of Radiography Statement of Accreditation⁷⁴ was accepted as defining a radiographer⁷⁵ from a non-radiographer. The Australian Institute of Radiography (2007) in its *Guidelines for professional conduct for Radiographers, Radiation Therapists and Sonographers* uses possession of a Statement of Accreditation as the means to define a radiographer. As discussed in chapter 1, providing radiographic services to a rural community would not necessarily identify rural radiographers; radiographers are not the only ones performing this service in rural areas. In some rural healthcare facilities where the workload does not warrant employment of a full time radiographer, radiographic duties already fall to remote operators⁷⁶. Remote X-ray operators are not radiographers and provide a limited range of radiographic services and examinations (Smith, 2007). Just prior to distribution of the questionnaire in 2007 to Western Australian rural radiographers, legislation was enacted to provide registration for Western Australian radiographers. This change in registration requirements resulted in a variation of the eligibility for the study for Western Australian radiographers. The new rules surrounding radiographer registrations in Western Australia were accommodated by altering the eligibility criteria for the Western Australian rural radiographers participating in the study to having registration with the Medical Radiation Technologists Registration Board of Western Australia (MRTRBWA) or a Statement of Accreditation. The documentation forwarded to Western Australian radiographers was reworded to accommodate this change by rewriting the eligibility question to include registration with the MRTRBWA along with AIR Statement of Accreditation. The inclusion and exclusion criteria for this study are listed in table 3.

⁷⁴ AIR Statement of Accreditation discussed in Chapter 1, page 39.

⁷⁵ Definition of radiographer discussed in Chapter 1, page 41.

⁷⁶ Remote operators discussed in chapter 1, page 33.

Inclusion Criteria	Exclusion Criteria
<p>To be eligible to participate in this study participants had to:</p> <ol style="list-style-type: none"> 1. hold either an Australian Institute of Radiography Statement of Accreditation or for Western Australian radiographers registration with Medical Radiation Technologists Registration Board of Western Australia, and 2. be providing radiographic services to a population of less than 100,000 (RRMA - R1 classification of rural). 	<p>The exclusion criterion for this study was for a potential participant to fail to fulfil either of the inclusion criteria, that is:</p> <ol style="list-style-type: none"> 1. not a radiographer as previously defined, that is, not holding either AIR SoA or for Western Australian radiographers registration with MRTRBWA, 2. providing radiographic services to a population greater than 99,999 (RRMA - R1 classification of rural).

Table 3 Inclusion/Exclusion criteria

Study Participants

Determining population size

Determining the number of radiographers providing radiographic services to rural communities with any accuracy is complicated. A review of the statistical analysis of 2006 Census data, set the rural and remote Medical Imaging Professionals population at 2,138 individuals (Australian Bureau of Statistics, 2006), although this is merely an estimate due to ABS confidentiality requirements⁷⁷ (Australian Bureau of Statistics, 2003). The ABS uses Australian Standard Geographical Classification (ASGC)

⁷⁷ It should be noted that discrepancies occur in ABS reported data due to the confidentiality requirements of the ABS relating to small cell sizes, where, in order to fulfil the requirements of the *Census and Statistics Act 1905*, in cases where the tables produce cells with very small counts, random adjustments are made to the data to avoid the risk of releasing data that may allow identification of a particular organisation or individual (Lowe and O’Kane, 2004).

remoteness classification which defines populations as city or country in terms of physical remoteness from goods and services (Australian Bureau of Statistics, 2003). The ASGC differs from the RRMA classification employed in this study as the RRMA system uses population numbers for determination of classification. The effect of these differences in criteria for degrees of remoteness for each of the classification methods may be seen when RRMA places all areas of capital cities as metropolitan, whereas ASGC has some areas of Hobart classified as Inner Regional Australia and areas of Darwin as Outer Regional Australia (Australian Institute of Health and Welfare, 2004). Unlike the RRMA classification system employed in this study, the census data may therefore have included radiographers working in areas of capital cities as rural, which adds a further level of inaccuracy to the numbers calculated. Scott and Cheng (2010) also identified difficulties sourcing accurate data around healthcare professionals working in allied health that resulted in their also relying on census data. These authors found that census data was the only source of national estimates but advise that, due to an inability to reconcile census data with their workload survey data, census data should be treated with caution (Scott and Cheng, 2010). The 2006 census data estimates of radiographers, although inaccurate, provided the only means of ascertaining rural radiography population numbers because, even in those states that offer registration, there was no feasible method to distinguish rural radiographers from metropolitan radiographers. Therefore, for this study it has not been possible to draw statistical conclusions in comparisons of respondents and actual numbers of rural radiographers, because no accurate comparative data could be identified. The questionnaire data has provided a demographic profile⁷⁸ of the respondent radiographers and the respondents' replies have been analysed to ascertain the frequency, through frequency analysis, of aspects of rural radiographic practice pertinent to this study compared to the respondent radiographer cohort.

Data Collection and Analysis

This section focuses on the development of the first data collection technique, the questionnaire. The rationale for the employment of a paper based questionnaire and the

⁷⁸The demographic profile of the rural radiographers forms part of the questionnaire results which are included as Appendix F.

processes adopted in crafting the questionnaire to ensure that it would fulfil the purpose of answering three of the guiding research questions is outlined.

First Data Collection Phase – The Questionnaire

Development of the questionnaire

There is a lack of current and detailed data on the rural allied health workforce, which includes radiography (Keane et al., 2008; Scott and Cheng, 2010). Furthermore the literature review showed that there are significant gaps in the knowledge surrounding radiographic interpretation, communication and disclosure of radiographic opinion by rural radiographers. In order to canvass a wide range of rural radiographers, a data collection strategy that would begin to provide answers to the research questions, allow examination of rural radiographic practice and provide a demographic profile of rural radiographers was required. No valid instrument could be identified for eliciting information on these aspects of rural radiography from a wide ranging audience of rural radiographers.

A questionnaire was chosen as an appropriate method for initial data collection and, as no pre-existing questionnaire was identified one had to be developed, validated via a pilot and then administered. The format of a paper based self-completion questionnaire was chosen as rural radiographers are geographically separate from each other and the option of the researcher visiting a large number of rural radiographers was considered to be outside the resources of the study⁷⁹. The reasoning for choosing a print based questionnaire over an electronic version was essentially twofold. Electronic distribution of a questionnaire still required a third party to either distribute the questionnaire or to invite potential participants to complete the questionnaire, and as already outlined no such third party existed. The second reason is that it was not known what level of access to or competency with electronic media for using a web based questionnaire rural radiographers might hold. Shanahan (2009) found that

⁷⁹ Limitations on resources is a concept supported by Calder (1998) who reveals that, although it is not ideal, researchers work under practical constraints such as time and finance that play a role in determining research design. For example, the option of requesting a rural radiographer to attend a session with the researcher was considered to be an impractical impost in terms of both cost and logistics for participants because rural and remote radiographers may well be sole operators or work in small groups.

radiographers in Queensland and Victoria did not always have ready access to the internet in their workplace and that access was not uniform across or even within these two Australian states. The concern about computer access and competency is also revealed in a study into internet use by ten professional groups⁸⁰ in rural Australia (Herrington and Herrington, 2006). This study revealed that, although most of the professionals had internet access, technological difficulties associated with low bandwidth, superseded computers, power surges and outages and server unreliability plagued rural and remote internet users (Herrington and Herrington, 2006). A further contributing factor for querying effective internet use is that some of the professionals surveyed in this study admitted to their own lack of technological competence (Herrington and Herrington, 2006). Although radiographers were not included as one of the professional groups surveyed, other allied health professionals were included and the experience of professionals in health may be mirrored in the experiences of their professional colleagues (Huntley, 1991).

Questions for the questionnaire were developed in light of the research questions and the relevant field literature. The supervisory team was also used in question development to establish how to phrase each question and evaluate respondents' interpretation of the questions' meaning. The questions were also written mindful of Brace's (2004) recommendations for a questionnaire that maintains a respondent's interest, doesn't require too much time or effort and a layout designed for ease of data entry. Converse and Presser (1988) maintain that people are most interested in questionnaires bearing on their own experiences and are sensitive to not only the context but also to the particular wording. Individual professions use unique language and terminology (Decker and Iphofen, 2005). The researcher and one member of the supervisory team were rural radiographers and so were both cognisant of the language of rural radiography. This allowed for both conscious and unconscious weaving of the language of rural radiography through the wording of the questionnaire. The questionnaire was undertaken for the purpose of addressing some of the research questions by providing a demographic profile of the respondent rural radiographers and revealing patterns of radiographic service delivery along with a summary of the issues

⁸⁰ The ten professional groups selected for Herrington and Herrington's study were dentists, dieticians, medical practitioners, nurses, occupational therapists, pharmacists, physiotherapists, psychologists, social workers and teachers.

and practices around radiographic interpretation, communication and disclosure of radiographic opinion. The demographic and background questions were posed first followed by knowledge, experience, behaviour and attitude questions relating to radiographic interpretation and disclosure of radiographic opinion.

The questionnaire was developed to elicit information on

- demographic data (age, gender, qualifications, training, and current employment)
- reporting of radiographs
- radiographic opinion
- radiographic interpretation
- disclosure of radiographic opinion
- medico-legal responsibility for disclosure of radiographic opinion
- X-raying family/friends
- preparation for rural practice

The questionnaire⁸¹ comprised a total of 28 items and, in order to obtain maximum data for minimum impost on respondents, the questionnaire consisted of a combination of open and closed response questions. Only two of the questions could be considered truly open and allowing free text replies, so that the majority of the questionnaire comprised closed questions. Some of the closed questions however were formatted to include probes. Probes were employed to allow the respondents to provide details or comments for some of their answers. A total of nine of the closed questions were dichotomous questions allowing the respondent to choose between two options, such as 'Yes' and 'No'. The formatting for these dichotomous questions was such that in choosing between a 'yes' and 'no' answer the respondents were directed to a probe of the closed questions. For example, where the question was 'Did you gain your radiography qualifications in Australia?' and the possible replies were 'Yes' or 'No', the 'No' reply led the respondents to 'please provide details'. The result of this method of formatting with the probes of closed questions allowed another window on the meaning of items and was an efficient way of combining some of the advantages of both open and closed questions (Converse and Presser, 1988). The inclusion of open

⁸¹ A copy of the Questionnaire is included as Appendix L

ended questions into the questionnaire provided insight into the humanistic and tacit dimensions of rural radiographic practice. The rationale for combining both question types and the inclusion of probes is that closed questions may restrict the depth of participant response resulting in reduced or incomplete data (Rattray and Jones, 2007). The advantage of closed questions is that they limit the respondents' possible replies and so are more specific than open questions, with the result being that the respondents are all replying within the same frame of reference (Converse and Presser, 1988). The flow-on advantage of the limited number of replies to precoded closed questions is that it allowed for the answers to be converted to numerical form which facilitated analysis and cross-tabulation which further allowed comparisons of data sets such as age against gender.

Ensuring rigor in the questionnaire

The following section outlines the methods adopted throughout the first phase of the study to ensure its validity. Due to the structure of both the study as a two phase process and the structure of this chapter, the rigor of the questionnaire and semi-structured interview components of the study have been addressed separately.

Validity of the questionnaire

Brace (2004, p. 10) suggests that ultimately the questionnaire writer's job is '...to write a questionnaire that collects the data required to answer the objectives of the study as objectively as possible without irritating or annoying respondents, whilst minimizing the likelihood of error occurring at any stage in the data collection and analysis process'. Therefore, in order to ensure that a reliable and valid questionnaire resulted, a logical, structured and systematic method process for questionnaire development and design was adopted (Rattray and Jones, 2007) and this is outlined in the following.

Construct Validity

Validity of design refers to the extent to which the findings are accurate or reflect the purpose of the study (DePoy and Gitlin, 1998). During the writing of the questions for the questionnaire the research questions were frequently revisited to ensure that the questionnaire items reflected the intention of the research (Rattray and Jones, 2007). The questionnaire was not designed to provide a statistical measure of the rate of

occurrence of radiographers' participation in radiographic interpretation, communication and disclosure of their radiographic opinions, but rather to provide demographic data and to test whether the phenomena of communication and disclosure of radiographic opinion as suggested by the limited field literature, occurred in Australian rural radiographic practice. This is not to say that this phenomenon is restricted to rural radiographic practice and not experienced by radiographers working within an urban environment, but it was the literature that suggested that it is rural radiographers who are participating in radiographic interpretation and that they have been providing radiographic opinion to referring clinicians for many years (Hall et al., 1999; Smith and Lewis, 2002; Cook et al., 2004; Nuss, 2007).

The literature review further suggested that patients are requesting diagnostic input from radiographers (Dimond, 2002, p. 172). This needed to be tested before moving forward and involving radiographers in interviews. As such, the construct validity of the questionnaire was demonstrated as it did reveal that rural radiographers are involved in this phenomenon. Furthermore, the data demonstrated a general trend that the more rural, the less access both radiographers and referrers had to a radiologist. Specifically, it was only those radiographers working in areas designated as R2 and less who had a radiologist who was offsite albeit linked by teleradiology and perhaps providing a visiting service. Also demonstrated was a general trending towards daily input to referrers the more remote the area in which the radiographer was working. Requested disclosure by patients was also demonstrated to increase with rurality. For example, all the respondents from the more remote RRMA classifications Rem 1 and Rem2 indicated that patients requested diagnostic input from the radiographer. As the RRMA classification moved to centres with greater populations however, the trend was towards a lesser degree of requests from patients for diagnostic input. The less remote the radiographer, the fewer requests from the patient for diagnostic input.

As previously stated the purpose of the questionnaire was to provide a demographic snapshot of rural radiographers and to determine their involvement in radiographic interpretation, communication and disclosure of their radiographic opinion, for which descriptive statistics⁸² are sufficient. There was however, a general

⁸² Descriptive data analysis is described on pages 146-151.

trend towards the more rural, the more instances of disclosure. Therefore it has been possible to make predictions about the construct of disclosure in terms of the related construct rurality which has established a degree of construct validity for the questionnaire (Brockopp and Hastings-Tolsma, 2003). The construct validity of the questionnaire was further supported by the findings of the analysis of the interview data where the extent and nature of radiographers' involvement in radiographic interpretation, communication and disclosure was explored and supported.

Content validity

In line with the recommendations of several authors, a pre-test or pilot of the questionnaire was conducted (Dillman et al., 1974; Converse and Presser, 1988; Polgar and Thomas, 1998; Brace, 2004) prior to more wide spread administration. It was essential to test the questionnaire because, even though the researcher is a rural radiographer, there should be no assumptions that the researcher and the rural radiographer respondents share a common language and so will interpret the wording of a statement or question similarly (Rattray and Jones, 2007). There are a variety of techniques available for testing questionnaires (Bowden et al., 2002). Expert evaluation was chosen for testing the questionnaire and was provided by the Rural and Remote Practitioners Advisory Board (RRPAB)⁸³ of the AIR. The testing of the questionnaire by expert evaluation with the RRPAB was also undertaken to establish content validity of the questionnaire. This process is in line with the recommendations of Rattray and Jones (2007) who suggest that, to assure face or content validity, the question items for a questionnaire should be generated from several sources that include experts and the relevant literature. The details of this process are outlined in the following section.

Piloting the questionnaire through expert evaluation

In order to comply with the testing of the questionnaire using expert opinion a declared, small scale, informal pilot of a complete questionnaire was conducted using the Rural and Remote Practitioners Advisory Board (RRPAB). The RRPAB were chosen because the '[r]espondents should resemble the target population' (Converse and Presser, 1988, p. 68) and, as advised by Brace (2004), the pilot respondents should also meet the eligibility criteria for the study in order for them to answer as respondents.

⁸³ RRPAB advise the Board of the AIR on matters relating to rural practice and health from the perspective of diagnostic radiography

This eligibility criterion was fulfilled because it is a requirement of the AIR that, in order to be a member of the RRPAB, along with current membership of the AIR the individual should be a radiographer working in a rural environment. Following recommendations that the pilot respondents be asked to make notes on the questions and routing instructions, the pilot respondents were provided with a comment sheet and requested to provide feedback on the clarity and layout of the questionnaire (Brace, 2004).

The questionnaire was pre-tested within the questionnaire context in order to establish that the respondents consistently understood the question concept as the researcher intended, (Collins, 2003). The pilot was not a rehearsal of the questionnaire but rather a test of the questions along with the survey process. To this end the pilot participants were provided with the same information as proposed for the questionnaire, albeit worded to fit the context of the pilot. Following Bowden's (2002) recommendations, the questions were sequenced as expected for the final questionnaire which enabled investigation of the questionnaire as a whole. The purpose of the pilot was to examine the length of the questionnaire and the time required to complete, flow, salience, ease of administration, responses and acceptability to respondents, in line with the recommendations of Collins (2003), and also to improve the validity and reliability of the questionnaire prior to wider distribution (Bowden et al., 2002). The pre-test also allowed the researcher to gauge the meaning attributed by the respondents to the questions posed on the questionnaire. It is imperative that a pre-test is undertaken as a failure to investigate the interpretation of questionnaire items may result in misinterpretation (Bowden et al., 2002), and consequentially a loss of validity of comparison between respondents' answers and any conclusions that might be drawn from the respondents' answers might be flawed (Collins, 2003).

The participants in the pilot were provided with a letter of invitation, a pilot questionnaire and a comment sheet. They were advised that it would take approximately 15 to 20 minutes to complete the pilot survey, but were also requested to note the time required to complete the questionnaire so that this information could be provided to future respondents as a more accurate reflection of the time required for them to complete the questionnaire. The pilot questionnaire respondents were also requested to take a further five to ten minutes to complete a comment sheet for feedback

on the survey, clarity and layout. The pilot questionnaire documentation was emailed to the members of the RRPAB two weeks prior to a board meeting and the completed documentation was collected at that RRPAB face to face board meeting. Completed questionnaires were returned by three members of the RRPAB. A dynamic component was introduced into the pilot of the questionnaire when some respondents discussed the pilot of the questionnaire with the researcher prior to the RRPAB board meeting in Melbourne in April 2007.

The results from the comment sheets and pilot questionnaire were then used to fine tune the questionnaire prior to its wider distribution. The respondents had mostly positive comments with regards to the questionnaire. Results from the pilot suggested 25 to 30 minutes would be a more accurate timeframe for completion of the questionnaire. An aggregate of the data collected from the comment sheet and any comments on the questionnaire form are reported in this thesis⁸⁴ as justification for the changes made to the questionnaire prior to its wider distribution and also to validate the project. The RRPAB suggested that formatting of the questionnaire needed to be tighter, but this issue arose because the questionnaires were emailed and so dependent upon the software used to download the document at the respondent's end. This point was however taken on board and great care was taken with printing the questionnaire for distribution to ensure that questions were not split over pages and that they appeared well spaced and easy to read. The changes to the questionnaire as recommended by the RRPAB respondents were only minor and so no repeat of the pilot phase was undertaken prior to administration. This position is consistent with the recommendations of Polgar (1988).

Distribution of the questionnaire

Finding a means of distribution of the questionnaire to rural radiographers was challenging. At the time of conducting the data collecting phase of the study there was no national registration for radiographers⁸⁵ and several states did not have radiographer registration. The result of the lack of national registration meant that there was no one body to act as third party to cover all of the states and territories. Although the AIR

⁸⁴ Results from the pilot are included as Appendix M

⁸⁵ National registration is discussed in chapter 1, page 40.

estimates that more than 70% of the healthcare professionals working within the fields of radiography, radiation therapy and ultrasound are involved in some aspect of the AIR (Australian Institute of Radiography, 2010), clearly not all radiographers are members of the AIR. The AIR does maintain a database of all radiographers with a Statement of Accreditation but confidentiality issues prevent outside access to this database. Access to this database or databases of those states requiring radiographer registration would also not have solved the access problem because the issue of determining rurality would still have existed.

The questionnaires for this study were used to provide a demographic snapshot of rural radiographers and also to provide the foundation for the second stage of the study, in depth semi structured interviews. The interviews as a qualitative data collection technique drew on small purposeful samples in order to explore aspects of rural radiographic practice. The idea was not to generalise the results of this study to the wider rural radiographic population but in adopting an interpretative approach this study set out to provide a deeper understanding of radiographic interpretation, communication and disclosure by Australian rural radiographers. Therefore in fulfil the purpose of the questionnaire and collect data from radiographers undertaking clinical practice in rural Australia the questionnaire was distributed by contacting three Australian radiographers, from three different states of Australia, who had access to cohorts of rural radiographers⁸⁶. Each of these radiographers agreed to act as a third party administrator and so became intermediaries⁸⁷ for the questionnaire component of the study. Packages containing a covering letter and individual questionnaire packs were forwarded to the intermediaries for distribution to their rural radiographer peers. The covering letters reiterated the inclusion criteria for the study, provided a brief overview of potential for future participation in the study and also listed the researcher's contact details in the event of any queries. Each of the questionnaire pack contained an

⁸⁶ As a result of the dissemination methods adopted by the intermediaries it was not possible to exclude the RRPAB pilot study participants from the study. This study did not set out to test an intervention nor were first reactions sought in response to the questions posed therefore the possibility for inclusion of the pilot study participants within the wider study was not considered a disadvantage but rather the potential for inclusion of members of the RRPAB may have added to the number of rural radiographer cohort. The pilot study data which is presented separately in this thesis has not been included with the wider study data but rather if members of the RRPAB replied again then they answered the same questionnaire as their rural radiographer peers.

⁸⁷ Intermediaries acting as an intermediate agent between the researcher and the participants were used to avoid the ethical complications of the researcher canvassing for participants directly.

information sheet that outlined the two key questions used to determine the eligibility of the respondent for inclusion in the survey component. The questionnaire reiterated these two key questions so that respondents were required to reply to questions as to whether they held a Statement of Accreditation and were providing radiographic services to a population of less than 100,000 (RMA-R1 classification of rural). Along with the questionnaire, each pack contained an invitation to participate in the study, two self-addressed return envelopes and a separate contact details page inviting respondents to provide contact details if they agreed to participate in interviews.

The questionnaires were distributed as a one-off through these three different intermediaries to three geographically separate areas of Australia. A total of 185 questionnaire packs, which represents just under 9% of the estimated rural and remote Medical Imaging Professionals population of 2,138 (Australian Bureau of Statistics, 2006), were distributed to the selected Australian rural radiographers between August and November 2007. The intermediaries who assisted with the questionnaire accessed rural New South Wales through ‘Tamworth after July’⁸⁸, rural Western Australia and rural North West Tasmania. The initial distribution from the researcher was the same to each intermediary; however the intermediaries chose different methods for deployment of the questionnaire packs. The sample size of each cohort of rural radiographers was determined by the estimated population to which the intermediaries had access. In the case of Tamworth, the intermediary estimated 40 survey packs would be sufficient. For Western Australia the intermediary initially requested 100 questionnaire packs that were posted by the intermediary to Western Australian Country Health Service (WACHS)⁸⁹ radiographers. On request, a further 20 questionnaire packs were sent to the Western Australian intermediary for distribution through an education weekend to rural radiographers working for privately owned medical imaging departments. For the North West Tasmanian cohort, 25 packs were distributed through the intermediary.

The intermediaries for Tasmania and Western Australia through their professional networks were able to provide access to the majority of rural radiographers for their individual states. The geographical isolation of rural radiographers working in

⁸⁸ ‘Tamworth after July’ is usually called ‘Tamworth in July’ and is a medical imaging conference organised by the Tamworth Base Hospital as an annual event for the NSW branch of the AIR.

⁸⁹ WACHS is a division of the Government of Western Australia’s Department of Health that is responsible for the delivery of acute and primary health services to regional WA.

Western Australia necessitated a mail out of questionnaire packs to individual rural radiographers. In order to protect the privacy of the Western Australian individuals, plain envelopes containing the questionnaire, invitation to participate, two return envelopes and contact details form for further participation were deployed to the third party intermediary who in turned addressed and posted the packs to the rural radiographer's work address. In Tasmania a similar method was adopted, but in this case the intermediary chose to hand deliver packs to individual rural radiographers over two separate sites.

Ensuring that the questionnaire packs reached the target population was one step in securing data from rural radiographers. In order to maximise the return rate for the study several strategies were employed. A fundamental principle to questionnaire mail out techniques is that any aspects of the data collection process that are expected to affect the response rate should be manipulated so as to increase the response rate (Dillman et al, 1974; de Vaus, 1999) because the response rate to questionnaires is typically low (Dillman et al, 1974; Goyder, 1985; de Vaus, 1999). To this end the refined questionnaire was distributed as part of a questionnaire pack to each of the intermediaries. Along with the questionnaire each pack contained an invitation to participate, two return envelopes and a separate contact details page inviting respondents to provide contact details if they agreed to participate in interviews. The return envelopes were stamped and self-addressed to facilitate return of the questionnaire and consent form and also to negate the cost to the respondent. No follow up was required as sufficient questionnaires were returned to meet the purpose of the questionnaire component of the study.

Managing the questionnaire data

A total of 67 ($n = 67/185$; 36%) completed questionnaires were returned out of the initial 185 questionnaire packs that were distributed. The eligibility criteria⁹⁰ of

- holding either an Australian Institute of Radiography Statement of Accreditation or for Western Australian radiographers registration with

⁹⁰ Inclusion/Exclusion criteria detailed on pages 131-133

Medical Radiation Technologists Registration Board of Western Australia,
and

- and to be providing radiographic services to a population of less than 100,000 (RRMA - R1 classification of rural)

for each of the respondents were checked for this study. The information sheet included in each questionnaire pack contained the two key criteria used to determine the eligibility of the respondent for inclusion in the questionnaire component of the study. These two eligibility criteria were reiterated as questions in the questionnaire. This double check of eligibility was shown to be valid when the examination of the results from the returned questionnaires revealed that some of the respondents failed the inclusion criteria. The exclusion of the ineligible questionnaires resulted in a total of 60 questionnaires eligible for analysis which provides a return rate of ($n = 60/185$; 32.4%). The return rates and the results from the check of the eligibility criteria that resulted in the exclusion of seven of the returned questionnaires are presented in table 4 according to the location of origin for the completed questionnaires.

Location	No. sent	No. returned	Fitted criteria	Sent/fitted criteria
Tamworth	40	17	17	42.5%
WA	120	36	31	25.8%
Tasmania	25	14	12	48%
Totals	185	67	60	32.4%

Table 4 Questionnaire return rates

Analysis of the questionnaire data

The data from the questionnaires included both quantitative and qualitative elements and was therefore analysed with the assistance of SPSS® for MS Windows Version 15.0 (2006) for Windows and QSR NVivo 8®. SPSS® is a computer program that enables questionnaire data to be manipulated in various ways to provide statistical analysis. QSR NVivo 8® is a qualitative data analysis computer software package that allows the user to organise and analyse non-numerical text based data such as transcripts from

interviews. Data collected from the quantitative sections of the questionnaire were converted into numerical form and entered into SPSS®. For example, with the dichotomous questions that allowed two alternate replies such as ‘yes or ‘no’ then the ‘yes’ replies were assigned a value of ‘1’ and the ‘no’ replies were assigned a value of ‘2’. This process facilitated analysis using SPSS® because the software uses number codes to deal with the variables regardless of whether the variables were originally numerical (Maltby et al., 2007). The free text replies to the qualitative open ended questions were unsuitable for analysis using SPSS® and were therefore analysed using thematic analysis⁹¹ with data coding assisted using QSR NVivo 8®.

The purpose of the questionnaire was to provide descriptive data of the rural radiographer population in relation to radiographic interpretation, communication and disclosure of their radiographic opinion. These measures are known in quantitative data analysis as variables. A variable may be considered as a factor, an indicator or a dimension that varies from case to case (Harris, 1999). For this study the variables reflected the questionnaire questions. To analyse the variables, descriptive analytic techniques including frequencies, mean, minimum-maximum range and percentages were used to develop simple summaries about the sample. Descriptive statistical analysis allowed understanding of the data collected by summarising the data (DePoy and Gitlin, 1998) and providing exploratory data analysis (Unsworth, 1999). Frequency distribution refers to the distribution of values for a variable and also the number of times that value occurs (DePoy and Gitlin, 1998). The frequency analysis provided a breakdown of each of the analysed variables and allowed both the frequency in relation to the total number of cases and the percentages to be expressed. For example table 5 shows how the analysis of the variable ‘gender’ allowed the gender distribution of the respondents to be determined.

Gender (n=60)	Frequency	Percentage
Male	17	28.33%
Female	43	71.67%

Table 5 Gender Distribution

⁹¹Thematic analysis is described later in this chapter on page 161. The questionnaire as a minor contributor to the study provided only a small amount of free text data and so this description of thematic analysis focuses on the major contributor the interview data. The results analysis of the questionnaire data were subsumed within the analysis of the interviews where corresponding themes were identified.

Other variables were subject to univariate frequency analysis and included the age of the radiographer and the numbers of years qualified. By using the transform and compute variable function in SPSS®, it was possible to translate the respondent radiographer's year of birth and the year in which the radiographer indicated that they had obtained their radiographic qualification into the age and the number of years qualified for each respondent. The questionnaire data was collected in 2007 and so the ages and years qualified of the respondent radiographers have been calculated from this date. For example, a respondent who indicated that they were born in 1980 and qualified in radiography in 2000 was calculated as being 27 years of age and qualified as a radiographer for seven years.

The computed variables were then analysed using descriptive statistics to provide mean, minimum and maximum to provide an overview of the age and years qualified of the questionnaire respondents. 'Mean' is calculated by SPSS® by adding together all the values from each variable and then dividing by the total number of respondents (Maltby et al., 2007). 'Minimum' is the minimum age calculated from the supplied year of birth and 'maximum' is the maximum age calculated from the supplied year of birth. The use of frequency distribution statistical analysis provided measures of the respondent rural radiographer population revealing that the maximum age was 61 years, the minimum was 21 years and the mean was 40.6 years⁹².

Some variables required analysis that expressed the number of respondents who indicated that they were involved in a particular activity in order to establish its value as a future line of inquiry. For example, SPSS® was used to express the frequency of the respondents' indicated involvement in disclosure of their radiographic opinion to patients as a percentage. This analysis provided a breakdown of the variable relating to the respondents' involvement in disclosure of their radiographic opinion relative to the total number of respondents. Percentages as a descriptive statistic allowed the data to be summarised and also provide some meaning to the findings (Maltby et al., 2007). For instance, 70% (n = 42/60) of the questionnaire respondents indicated that they did disclose their radiographic opinion to their patients. This analysis revealed that a large

⁹² Age was calculated from supplied year of birth and the year of questionnaire data collection which was 2007.

percentage of the respondents are involved in disclosure so further investigation was warranted through the second phase of the study⁹³.

Further lines of inquiry were identified as a result of exploratory analysis of the data. For example, another line of inquiry to emerge from the frequency analysis was the ambiguity surrounding the medico-legality of rural radiographers' disclosure of their radiographic opinion. Fifty percent of respondents reported that they believe that they will be held medico-legally responsible for disclosing their radiographic opinion, 25% (n = 15/60) believe that they will not be held medico-legally responsible for disclosing their radiographic opinion and 23.3% (n = 14/60) indicated that they don't know their medico-legal position with regard to disclosure. The value of analysing variables such as the respondents' belief in their medico-legal responsibility with regard to disclosure shows how it is possible to identify important lines of inquiry for deeper interrogation and analysis in the qualitative phase of this study. Indeed exploring and describing data using exploratory data analysis is recognised as providing a researcher with the background to conduct further analysis and research (Unsworth, 1999).

Once the frequencies of the variables were established and some preliminary lines of enquiry were emerging, it was possible to identify some aspects of the data that could move beyond univariate descriptive analysis to incorporate bivariate analysis. Bivariate analysis allows examination of the relationship between two variables (DePoy and Gitlin, 1998). One method for demonstrating the relationship between two variables is a contingency table (DePoy and Gitlin, 1998, Unsworth, 1999). In contingency tables which represent two dimensional frequency distribution, the attributes of one variable are related to the attributes of another (DePoy and Gitlin, 1998). A contingency table provides the numbers of respondents who fell within each cell, the row marginal provides the frequency for each row and the column marginal provide the frequencies for each column (Unsworth, 1999). Furthermore, a contingency table provides a cross-check because the row and column marginal should add up to the sample size. The SPSS® function crosstabs was used to generate information about a bivariate relationship and to produce contingency tables. For example, analysis of the questionnaire data using cross-tabulation allowed for comparison between the types of

⁹³The second phase of the study, in-depth semi-structured interviews, is discussed later in this chapter on page 152.

facility the radiographers indicated was responsible for their training to preparedness for rural practice. The contingency table 6 demonstrates the facility for training displayed against prepared for rural practice.

Facility for training	Prepared for rural practice		total
	Yes	No	
University capital city	14	13	27
University regional city	6	1	7
Hospital capital city	10	2	12
Hospital regional city	2	2	4
Hospital rural town	7	0	7
Other	1	1	2
Total	40	19	59 ⁹⁴

Table 6: Facility for training and preparation for rural practice

This bivariate analysis demonstrated in table 6 shows that all the respondent radiographers who trained in a hospital in a rural town believed that their training prepared them for rural practice, but for the other training facilities some of the radiographers began to indicate that did not believe that they were prepared for rural practice. Where the respondents indicated that the training facility was a university in a capital city, very nearly half the radiographers did not believe that their training prepared them for rural practice. This analysis indicated that preparation for rural practice was a potential future line of inquiry.

A number of bivariate relationships were examined in this study in order to identify future lines of inquiry. It was from this demonstrated relationship or lack of relationship that the value of potential lines of inquiry was established. For example, bivariate analysis of the data revealed that, when teleradiology is one of the options utilised for an urgent report when the radiologist is not on site, 63.3% (n = 38/60) of respondents still indicated that they were called upon to have input into radiographic opinion. Furthermore, when clinician diagnosis is one of the options utilised for an urgent report when the radiologist is not on site, 27% (n = 16/60) of respondents still indicated that they were called upon to have input into radiographic opinion. The relationship between these variables revealed that rural radiographers are involved in

⁹⁴ One questionnaire was excluded from this bivariate analysis because an answer was not provided on the question of preparation for rural practice.

radiographic interpretation and communication of their radiographic opinion. Rural radiographers' involvement in radiographic interpretation and communication was therefore established as a line of inquiry.

Demographic Profile of Questionnaire Respondents

Analysis of the questionnaire data also enabled the establishment of a demographic profile of the rural radiographer respondents. The following is a brief synopsis of the respondent rural radiographers' demographic data⁹⁵ which is provided here in order to retain the integrity of the other findings of the study which are presented in chapters 5 and 6. A total of 67 rural radiographers completed the questionnaire. However seven of the returned questionnaires were submitted by radiographers who fell outside the selection criteria and so these questionnaires were culled prior to analysis. The culling of seven questionnaires left the remaining 60 questionnaires to provide the data for analysis and also to provide the demographic profile of the questionnaire respondents.

The respondent radiographers ranged in age from 21 to 61 years of age. The gender distribution of the respondent radiographers was over 2/3 female (n = 43/60; 71.7%) and less than 1/3 male (n = 17/60; 28.3%). The majority of the radiographers gained their radiographic qualifications in Australia (n = 47/60; 78.3%) and had held their radiographic qualifications, which were predominantly diplomas (n = 27/60; 45%) and degrees (n = 24/60; 40%), for between one and 41 years. Only a small percentage of the respondent radiographers received their radiographic training in a rural area (n = 7/60; 11.7%) with the greater percentage (n = 40/60; 66.7%) receiving their training in a metropolitan area. Exactly half (n = 30/60; 50%) of the respondent radiographers held a postgraduate qualification, with ultrasound being the most common postgraduate qualification (n = 12/60; 20%). The majority of the respondents were working at the major healthcare facility for their area (n = 51/60; 85%) and over two thirds of the respondent radiographers (n = 40/60; 66.7%) were working in public practice, with fulltime employment (n = 42/60; 70%) the most common employment status. Most of the respondents (n = 54/60; 90%) were living in the same community where they were working and therefore indicated that they were providing radiographic services to people known to them.

⁹⁵ A more comprehensive demographic profile of the rural radiographers forms part of the questionnaire results which are included as Appendix F.

The results of the questionnaire analysis contributed to formation of the interview questions and are also presented in part in this chapter, the findings chapters and as appendix F. The results from the analysis of the questionnaire data were consistent with the argument advanced in the literature review that rural radiographers are engaged in radiographic interpretation, communication and disclosure of their radiographic opinion. The questionnaire results indicated that the humanistic values and beliefs held by the radiographers created the preconditions for the way in which they made decisions around disclosure of their radiographic opinion⁹⁶. From the analysis of the first data collection phase it appeared that complex, value-laden belief systems, underpinned radiographers' decision making and subsequent actions. The promising lines of inquiry provided by the questionnaire data analysis were the focus of the second phase of the study – the interviews.

Second Data Collection Phase – The Interviews

Recording rural radiographers' experiences of practice through interviews

The second phase of the data collection involved a set of in-depth semi-structured interviews with rural radiographers to gather information about radiographic interpretation, communication and disclosure of radiographic opinion at a deeper level than is possible through a questionnaire. The interviews were carried out between August 2008 and May 2010 with nine rural radiographers who met the inclusion criteria being included as key informants. Whereas in a questionnaire the researcher assumes that the questions posed are relevant, unambiguous, understandable and relevant, in an interview the assumption is quite different (Minichiello et al., 1999b). The rationale for semi-structured interviews is that the researcher does not know all the appropriate questions to ask because some of the questions and the answers emerge from the dialogue (Minichiello et al., 1999b; Gerson and Horowitz, 2002).

An inquiry into the complex, humanistic decision making around radiographic interpretation, communication and disclosure must necessarily capture and interrogate data that reflects meaning. The beliefs and values that radiographers draw upon to

⁹⁶ The complexity of rural radiographer's decision making around disclosure of their radiographic opinion to patients is discussed throughout chapter 6.

construct meaning in their professional world are critical to understanding the ways in which they choose to act. In this study of rural radiography where it has been revealed that the world of radiography is a social world, the interview is a useful method for social inquiry because of its ability to produce meaning and knowledge that will address the issues around which the research is concerned (Holstein and Gubrium, 1995), namely radiographic interpretation, communication and disclosure. The research design employed for this study did not set out to test a hypothesis but rather to discover and understand aspects of rural radiography which required research strategies. The literature reviewed revealed that there are significant gaps in the knowledge of rural radiographers' experiences of radiographic interpretation, communication and disclosure of their radiographic opinion. Insights into topics of which little is known are well provided by qualitative research methods which are inductive and exploratory (Morse and Field, 1995; Ng and White, 2005). The inductive approach to qualitative research includes data analysis and interpretation. Inductive data analysis is data-driven rather than coded according to preconditions or a pre-existing coding framework (Braun and Clarke, 2006). In this study data analysis was data-driven by the use of thematic analysis. In the inductive approach theoretical preconceptions are put aside and the data is interpreted and theorised from generalised statements provided by the participants' accounts of their experiences of the phenomenon under study (Gerber, 1999).

Qualitative methods, such as interviews, also work well in a study such as this one where humans are the instrument (Lincoln and Guba, 1985). The inclination for human as instrument research is to favour methods that are 'extensions of normal human activities' (Lincoln and Guba, 1985, p. 199). These methods therefore include listening and speaking, and so to follow this line of thought leads to interviewing as a research method. There is no better way to collect a useful and useable amount of data than to record interviewees' own words as they relate their own particular story (Wolcott, 1987). Accounts by interviewees can make the invisible, visible (Koch, 1998b). In viewing the interview from the constructionist perspective, the interview is a dynamic and social interaction (Holstein and Gubrium, 1995) and allows the radiographers' interpretations of social action to be documented as text which can then be transcribed and analysed.

Each interview was a social encounter and so the knowledge produced is the result of collaboration between the interviewer and interviewee so the interview itself is under construction (Holstein and Gubrium, 1995; Holstein and Gubrium, 2008). In this study the rural radiographers were not merely vessels containing the answers to the research questions posed, as this would be to consider them epistemologically passive and so not engaged in the production of knowledge (Holstein and Gubrium, 1995). The topics of discussion that emerged from the interview, although they are viewed as socially constructed, does not mean that they are ‘...illusionary, or a figment of the imagination’ but rather that they are grounded because they are based within the lived experience of those of a shared culture (Wright, 1988, p. 299). At the beginning of the interview the research topic established the parameters of the area of interest and provided a broad framework for the ensuing questions. The knowledge that each participant drew upon to answer the questions can be considered a diverse and multifaceted resource that emerges with its access being selective and constructive (Holstein and Gubrium, 1995), where each participant calls upon what he/she considers relevant to the topic and assembles the information to become a sensible reply (Holstein and Gubrium, 1995). Each participant in the study can therefore be seen as a ‘...narrator of experiential knowledge’ (Holstein and Gubrium, 1995, p. 30). In line with constructionist perspectives, interviews are a ‘...dialogical performance, social meaning-making acts and co facilitated knowledge exchanges’ (Koro-Ljungberg, 2008, p. 430) so that throughout the interview the meaning of what emerges is constructed (Holstein and Gubrium, 1995).

Interview structure

An interview guide⁹⁷ was developed specifically for this study as no previous research was identified into this particular area. The interview guide ensured that the key points to the study were addressed by each participant (Minichiello et al., 1999b; Patton, 2002; Liamputtong and Ezzy, 2005) with the development of the questions for the first iteration of the interview guide informed by the field literature, the SPSS® data analysis of the questionnaire and the free text comments provided by the questionnaire respondents. Lines of inquiry for the interviews were identified when the descriptive

⁹⁷ An example of an interview guide is included as Appendix N.

statistical analysis of the questionnaire data indicated that a large percentage of the respondents appeared to be involved in a particular activity. Similarly, further lines of inquiry were identified when themes emerged from the thematic analysis of the free text comments provided by the respondents.

Similarly to the questionnaire, the initial questions in the interview guide were used to ascertain that each participant fulfilled the selection criteria. Demographic questions were then introduced to build a picture of each interviewee and to add to the overall picture of rural radiographers. The interview was guided by open ended questions that led into the topical areas. The key topics were introduced as questions and the interviewees were invited to describe their experiences of these topics, to tell their story of rural radiography. An iterative process was utilised so that, as an issue was raised at one interview, it was raised as a question in subsequent interviews. The guide was therefore designed to support this outcome and so it was not a prescriptive list of questions and as new areas of information were revealed they were pursued within the interview. The data collection, analysis and interpretation occurred as a continuous process allowing emerging themes to influence further data collection. This study then did not use one interview guide but several—as the study evolved so did the interview guide.

Piloting the interview

The first iteration of the interview guide was used in a pilot interview with a radiography colleague with many years' experience as a rural radiographer. This approach to piloting an interview is in line with the recommendations of Gerson and Horowitz (2002) and Seidman (2006) who suggest that the first phase of an interview study is the development and pre-test of the interview guide. The interview pre-test ensured that the interview guide was theoretically informed and logically constructed and also ensured that the schedule was user friendly (Gerson and Horowitz, 2002). Piloting the interview also allowed the researcher to become familiar with the practical aspects of the interview. Following the pilot, a review was undertaken with the supervisor team which resulted in some minor changes being made to the interview guide. This review resulted in the inclusion of techniques for more inclusive framing of questions in order to allow more open ended responses to the questions posed.

In this study an iterative approach has been adopted to both data collection and analysis. Consequently the data collection and analysis were progressive, so that as an insight was gained in a previous interview it was used to improve the interview guide or to provide specific issues for discussion in subsequent interviews. It has been argued that separate pilot studies are not necessary in qualitative studies (Holloway, 1997; van Teijlingen and Hundley, 2001) where previous interviews are often used to improve subsequent interviews (van Teijlingen and Hundley, 2001). In this instance, because this pilot interview had been conducted within the parameters outlined in the research ethics approval⁹⁸ and the interviewee met the selection criteria for participation, the data from this interview has been included in the interview data set.

Inviting the participants to interview

Sampling strategies

In line with the theoretical framework supporting this study outlined in chapter 3, a sampling strategy that would yield ‘information-rich’ participants was identified (Patton, 2002, p. 230). It was necessary therefore, to select participants who were most likely to provide insight into the topic under study and who can be referred to as ‘key informants’ (Polgar and Thomas, 1998). The term ‘key informant’ is used to describe a person who has experienced the phenomenon to be studied and who is also willing to explain the beliefs and customs of the group under study (Roper and Jill, 2000). Therefore, for this study it was necessary to sample radiographers with personal knowledge of working within the rural environment because sample selection significantly affects the quality of the research (Coyne, 1997). Recruitment of participants for interviews was achieved through the distributed questionnaire packs as each pack contained an invitation to participate in the interviews. This has also ensured that it is rural radiographers who were invited to participate in the interview phase of the study. This is known as purposeful sampling where the study participants are intentionally selected according to the requirements of the study (Coyne, 1997; Llewellyn et al., 1999). The value in purposeful sampling is that it permits deep understanding by utilising information rich subjects (Sandelowski, 1995; Llewellyn et al., 1999).

⁹⁸ The ethical considerations for this study are outlined on page 128.

The recruitment approach of including an invitation to participate in interviews within the questionnaire pack resulted in a total of 23 volunteers. Two interview methods were planned for this study, face to face and telephone. While telephone interviews may lack the visual cues of face to face interviews, telephone interviews can provide valuable qualitative data if the nature of the interaction is considered prior to the interview and the interviewer employs the use of strong cues, more probing to encourage the participants to elaborate on their responses but also to resolve any ambiguities in the absence of visual input (King and Horrocks, 2010). Telephone interviews were carried out with the participants from WA and NSW as this allowed the inclusion of participants who were geographically distant from the interviewer and who otherwise would have been excluded due to the need for time consuming and expensive interstate travel (King and Horrocks, 2010) which was beyond the resources available for this study.

Face to face interviews were conducted with the Tasmanian rural radiographers. The contact details forms from the Tasmanian cohort were collected and the respondents were contacted by telephone or email as per their preferred method of contact. This resulted in 3 positive replies to requests for interviews from a possible 6 contacts. One of the Tasmanian interviews resulted from an interviewee suggesting one of her colleagues as a participant. This person was recruited with the interviewee acting as a third party intermediary. Commencing the interviewing phase of the study using the Tasmanian cohort of participants allowed the researcher to become familiar with interview techniques and also to gauge the approximate duration of the interview to ensure the interviewer was able to inform telephone participants of the time required (King and Horrocks, 2010). The four Tasmanian radiographers provided the first round of interviews and took place in September and October 2008. The venues were private—usually the participant's home or a private office in their workplace. Although public places may be more convenient for interviews, noise and lack of privacy preclude them as appropriate (Seidman, 2006). To ensure the personal safety of the interviewer whilst conducting interviews in private homes the interviewer carried a mobile phone and reflected periodically during the course of the interview upon the safety of continuing the interview in line with recommendations of King and Horrocks (2010).

For the next two rounds of interviews the remaining contact detail sheets were collated and emails were sent out to the first 4 respondents that provided email addresses. This method failed to elicit any positive replies and so attempts were made to telephone the remaining respondents. This approach resulted in 5 positive replies. At the time of scheduling the interviews the participants were informed that the interviews would take approximately one hour as outlined in the interview information sheet. Informing the telephone participants that the interview might require a substantial amount of their time also reinforced the point that a detailed discussion of their experiences (King and Horrocks, 2010) of radiographic interpretation, communication and disclosure was expected. The second round of two interviews took place in January 2010 and the third round of a further two interviews took place in May 2010⁹⁹. These interviews were all conducted by phone. In order to protect their confidentiality and minimise disruptions participants were advised to take their phone call in a private setting. The inclusion of the pilot interview resulted in a total of nine radiographers participating in the interview phase of the project from three states.

The radiographers who participated in the interviews were predominantly a subset of the same group who responded to the questionnaire. Therefore these same radiographers fit within the broad demographic profile provided by the questionnaire data. Specifically however, the gender balance of the interviewed radiographers was five females and four males, not the 2:1 gender balance of the questionnaire respondents or of the estimated total rural radiographer population. The age range of the group was from 36 to 62 producing an average age of 53.4 years. The number of years that the radiographers had been qualified as a radiographer was from 16 to 42 years with an average of 32.9 years. Although it did not occur with any apparent reason or design, six of the radiographers were born in the 1950s and qualified as radiographers in the 1970s. So although they were predominantly drawn from the same data set as the questionnaire respondents, the average age and the average of the number of years qualified was greater for the rural radiographers who were interviewed.

⁹⁹ The time elapsed between commencement and completion of interviews is in part due to the study design with data collection, analysis and interpretation occurring as a continuous process which allowed emerging themes identified in the thematic analysis to influence further data collection which is a time consuming process however the time delay was exacerbated by an unexpected disruption to candidature. Impact of the time delay was ameliorated by the use of a single interviewer which allowed for revision and cross comparison of the interviews. Interview technique is described on page 159 and data analysis is described on pages 160-166.

Recording and transcribing the interview

The participants for the interviews were interviewed either by telephone or face to face, at a mutually convenient venue, date and time. The interviews which ranged in time from 1 hour, 21 minutes and 52 seconds to 24 minutes 36 seconds were recorded and transcribed verbatim. Allowance was made in the consent form to recontact participants if it became evident that points identified in the interview needed clarification. As already outlined, semi-structured interview technique was the approach adopted. This recursive model was chosen as it encourages informants to provide relevant data through conversation with the researcher. This use of semi-structured questioning provided a greater breadth of data, as it is the type of questions and how they are structured that provides the framework from within which informants recount their experience (Seidman, 2006). The recounting of their experience by rural radiographers allowed insight into the meaning of rural radiography more than may be achieved by simply studying the process of radiographers performing radiographic examinations in a rural medical imaging department. The technique of allowing open-ended responses was also employed as this permitted insight into the participant's world (Polit and Beck, 2004; Seidman, 2006) with the interviewer introducing funnelling, or probing questioning techniques to elicit further information on specific points (DePoy and Gitlin, 1998; Polit and Beck, 2004). This technique provided rich accounts of rural radiographic practice in particular focussing on experiences of interpretation, communication and disclosure.

The background knowledge of a practitioner/researcher¹⁰⁰ can positively impact on the progress of the study and this should not be underestimated. As a rural radiographer, the researcher was a cultural insider, already having an understanding of the practice world of the rural radiographer (Smyth and Holian, 1999; Kanuha, 2000; Coghlan and Casey, 2001). A further benefit of a cultural insider is that it often allows insight that may not be so readily available to a non-radiographer, and it is this perspective that allowed the researcher to conduct the research 'with, rather than on' rural radiographers (Breen, 2007, p. 164). Furthermore the radiographer-radiographer relationship provides a familiar context for radiographers who are accustomed to

¹⁰⁰ Practitioner/researcher explored in greater detail on page 168.

sharing the wisdom and knowledge of radiography in their workplace (Decker and Iphofen, 2005). A practitioner/researcher is also able to use the everyday jargon of their colleagues and to draw upon their own experiences in order to frame questions within the interview process and follow up on the offered replies in order to obtain richer, deeper data (Coghlan and Casey, 2001). For example, Sola Decker (2006) found that, as a radiographer interviewing fellow radiographers, they related freely to her and used language and terminology that a non-radiographer might not comprehend because the language used within a profession includes terminology that is often unique to that profession (Decker and Iphofen, 2005). A constructionist interview as a co-facilitated exchange of knowledge also benefits from this shared language (Koro-Ljungberg, 2008). The result of this relationship is that the interview should be comfortable and familiar to the radiographer as an information sharing event. Consequently the interview builds on the radiographer-radiographer relationship and mutual exchange with the result being quality data, leading to the ultimate goal of quality research (Gardner, 1996).

In this study the interviewing ceased once it was noted that collective experience of the informants began to override idiosyncratic anecdotes, and it became largely possible to anticipate the answers to the questions so that subsequent interviews came to confirm earlier findings rather than leading to new insight indicating that theoretical saturation had been achieved (Gerson and Horowitz, 2002). It is a misconception in qualitative research that numbers are not important as an inadequate sample size limits the credibility of the findings of the research (Sandelowski, 1995). The sample size is determined by reaching theoretical saturation when enough interviews have been completed in order to draw and support theoretical conclusions on the concept under study (Llewellyn et al., 1999; Gerson and Horowitz, 2002). In this study theoretical saturation on the concepts being studied was achieved with nine interviews.

Data Analysis Techniques

The following section details how the data that resulted from the free text replies to the questionnaire and the in-depth semi-structured interviews was systematically analysed. It outlines how the qualitative data was prepared as text for analysis and describes the techniques of thematic analysis assisted by QSR NVivo8® to code data, organise, explore and analyse the themes. This technique known as thematic analysis is a method

for identifying, analysing, reporting themes and interpreting the data (Braun and Clarke, 2006). An inductive approach to the thematic analysis was undertaken. Inductive analysis is a process of coding the data without a pre-existing coding frame so that the analysis is data driven (Braun and Clarke, 2006).

Preparing qualitative data as text for analysis

In order to understand rural radiographers' experience of interpretation communication and disclosure of their radiographic opinion, it was necessary to organise, analyse and interpret the free text replies that resulted from the questionnaire¹⁰¹ and the in-depth semi-structured interviews. The free text replies from the questionnaire were transcribed verbatim into QSR NVivo8®. The digital recordings of each interview were initially transcribed into a Microsoft Word document in order to provide written text for analysis. While this is acknowledged as a time consuming process (Seidman, 2006), it was useful because it allowed the researcher to become immersed in the data (Braun and Clarke, 2006). In other words, the process of review of the interview transcript served as a means for preliminary data analysis as well as the functional purpose of providing correct and clean written text. The interview transcripts were then uploaded into QSR NVivo8®, which is a qualitative data analysis computer software package, to subject the data to thematic analysis.

Analysis of the qualitative data set

Thematic analysis is an iterative process that involves interpreting the themes in order to generate conclusions about what is happening and why it is happening (Thorne, 2000). It was therefore appropriate for analysing the data in a way that augmented the study's purpose of describing and interpreting authentic accounts of rural radiographers' experiences in order to generate substantive theory of radiographic interpretation and communication and disclosure of their radiographic opinion. Thematic analysis also has a theoretical freedom that allows it to be applied across different theoretical positions (Boyatzis, 1998; Braun and Clarke, 2006; Moss et al., 2008) which includes research framed within the constructionist perspective (Braun and Clarke, 2006).

¹⁰¹The process for analysis of the quantitative component of the questionnaire was outlined earlier in this chapter on page 146.

The data was analysed using the six phases of thematic analysis as suggested by Braun and Clarke (2006)¹⁰². The initial phase of the data analysis involved reading and rereading the data with initial ideas being recorded in a reflective journal¹⁰³ before moving onto a process of open coding using the QSR NVivo8® software. A code is a portion of the collected data that captures some important aspect of the data which represents a patterned response within the data set (Braun and Clarke, 2006). A code can consist of a single word, a sentence, part of a sentence or a paragraph that is assigned to the data to signify a salient attribute for a portion of the text. Although the interactive collection of the data and prior knowledge may result in a researcher coming to the analysis with some initial analytic thought, the coding was data driven (Braun and Clarke, 2006). In keeping with the inductive approach to the data analysis technique, the initial codes were drawn from the qualitative data set and not imposed on the text. This inductive approach to data coding during the initial stages of the analysis is consistent with the qualitative research framework used in this study.

The next phase of data analysis involved using QSR NVivo8® to assign the text of each identified code within the transcript to a node¹⁰⁴. A node is the first level of analysis where its relationship to other nodes may not be apparent, which is why it is referred to as a free node. While the initial coding phase was heuristic, the next phase was even more rigorous because it moved beyond labelling data to involve linking portions of data. At this point some excerpts from the text were assigned to multiple nodes which were defined *a priori*. This represented the beginning of identifying patterns within the text (Boyatzis, 1998; Braun and Clarke, 2006). The importance of identifying such patterns is not measured by how often it occurs but rather where it sits in relation to the research questions (Braun and Clarke, 2006). The analysis at this stage was a systematic examination to determine the relationships of not only the components of the rural radiographic practice world, but the relationship overall (Spradley, 1980).

Identifying relationships between the coded data and the emerging patterns allowed the data analysis to move forward to a deeper level of interpretation (Spradley,

¹⁰² A table depicting the phases of thematic analysis and how they have been applied to this study is included as Appendix O.

¹⁰³ Reflective journal is discussed greater detail later in this chapter on page 167.

¹⁰⁴ NVivo8® refers to codes as nodes; free nodes refer to the first level of analysis and a collective of nodes is referred to as a tree node.

1980; Braun and Clarke, 2006). It was not a linear but rather a cyclical process whereby the data coding and analysis evolved together, as each informed the other (Wolcott, 1987). During this phase of data analysis concepts began to emerge from the data analysis cycles. Further analysis of the free nodes allowed many of the free nodes to be sorted into tree nodes. Tree nodes are a collective of nodes which indicates the next level of data analysis where a relationship between the free nodes was identified. These were collated into potential themes by gathering all relevant data together. The idea of this form of analysis is to move beyond simply describing to revealing and explaining components of the social patterns identified or the conduct that has been observed (Morse and Field, 1995).

Thematic analysis took place at the explicit level and also at a latent and interpretive level (Boyatzis, 1998). Thematic analysis at the explicit level means that the themes are identified explicitly within the text, within what the participant has written (Braun and Clarke, 2006). Thematic analysis at the latent level looks beyond the semantic content of the text and begins to identify the underlying ideas (Braun and Clarke, 2006). The development of the themes at the latent level required interpretation as the analysis is not just descriptive but is theorised (Braun and Clarke, 2006). The identification of semantic and latent themes from the text revealed how rural radiographers experience and understand radiographic interpretation, communication and disclosure of their radiographic opinion. This approach required studying the text as a whole, not only in the context of the words spoken but also the unsaid, but still within the constructionist framework. The social constructionist framework seeks to focus not on individuals but to theorise on the sociocultural contexts and the conditions that have resulted in the individual accounts (Braun and Clarke, 2006) of rural radiography.

Explicit themes were more easily identified as they contained words that related directly to the question posed. Each theme, whether latent or explicit, was awarded a descriptive name that provided a sense of the content of each theme. A review of the themes was then conducted to ensure that the potential themes fitted both within the coded extracts and also the entire data set. Latent themes required careful sequenced analysis of the text, as they are implied, not directly stated. For example, only one

participant identified her radiographic opinion that she conveyed to her patients as a white lie, as this excerpt shows:

*RR 2: Well oh yes, no it would always be a little one I mean their whole left lung might be collapsed and I would just say it is just a little one...Those **white lies**.*

As analysis of the data progressed, it emerged that other participants were using the same diminutive language in their disclosure. However they did not refer to it as a white lie as the following excerpts demonstrate:

*RR 1: ...and sometimes I'll whisper to the patient I think that you might have a **crack** but it's really hard to see...*

*RR 3: And ... there is an area on the lung that looked very consistent, well, very consistent with being a cancer and ... he asked me what was there and I said well there is a **shadow** there but ... I think they will probably do further investigation for and ... I said I don't know exactly what it is but I imagine you'll probably come back for a CT or something like that ... and they will investigate it further and find out exactly what is going on.*

*RR 8: I'm tempted to say no wonder your sore you've got a **crack** in your mandible or something*

These were all examples of white lies but were not explicitly stated as such by the participants and were not identified as examples of white lies in the initial analysis. It is the constant moving between the data set (the coded data and the data that has been analysed during thematic analysis), that allowed for refining of the theme that became white lies (Braun and Clarke, 2006).

The coded data was reviewed several times in order to examine the collated extracts for each theme (Braun and Clarke, 2006). There were some isolated instances where the data did not fit the stronger emerging themes. In these instances this data was re-analysed and in some cases this resulted in the creation of a new theme. Sometimes however, it became apparent that what was initially established as a theme did not carry sufficient data to support it as a theme. For example, in one of the early analyses, a section of data describing an emotional shield that a rural radiographer indicated she employed to provide protection from the distress of encountering someone who was

known to her as a patient was identified as a potential theme. This concept of an emotional shield was not identified in subsequent interviews at either the explicit or implicit level. While this rural radiographer participant provided a vivid description, it did represent comprehensive and inclusive analysis and so at best could be considered anecdotal (Braun and Clarke, 2006). This resulted in this theme being removed from the analysis.

The data set was reread to ascertain that the identified themes fitted with the data set and to identify any additional themes that had been missed in previous data coding and to ensure that the themes were coherent and internally consist (Braun and Clarke, 2006). In checking the relationship between the themes, it was identified that some of the initial themes were actually sub-themes. For example, it was recognised that *white lies*, *amorphous language* and *radiographer's whisper* fitted better within *language to minimise disclosure* rather than sitting separately under the theme *Selective Truth*. Once it was established that the themes fitted the data set, a thematic table of analysis¹⁰⁵ was generated. Table 7-uses the concept of the diagnostic gap to depict the way the coded data was organised to interrogate relationships and to identify emergent themes.

Coded Data (free node)	Relationship	Theme (tree node)
Delay in reporting	Results in	The diagnostic gap
perceived health professional inadequacies in image interpretation	Is part of	
radiographers triaging patients based on their radiographic images	Is because of	

Table 7: Relationships between coded data and theme ‘diagnostic gap’

The thematic analysis of the rural radiographer interviews resulted in the identification of six key themes, which form the conceptual framework for presenting the findings in detail in chapters 5 and 6.

- Beyond the technical
- The diagnostic gap
- Strategies radiographers employ for responding to the diagnostic gap

¹⁰⁵ A section of the thematic table of analysis demonstrating the hierarchy of themes for the key theme ‘Disclosure of radiographic opinion to patients’ as a flowchart is included as Appendix P.

- Factors that inhibit radiographers' actions to close the diagnostic gap
- Navigating the diagnostic gap with referrers
- Disclosure of radiographic opinion to patients

Thematic analysis does not end with the coding of the data and the assignment of themes. With thematic analysis it is necessary to conceptualise the data patterns and the relationships between the themes (Braun and Clarke, 2006). It is at this point that thematic analysis moves beyond description to produce a story, in this case a story of rural radiography. The relationships between the key themes are represented in a Venn diagram (see Appendix Q). Vivid extracts that captured the essence of the themes were chosen from the data as representative examples of each theme. These extracts are regarded as narratives of the practice world of the rural radiographer and were therefore used to substantiate the claims made about the study findings throughout chapters 5 and 6.

Thematic analysis as a form of data analysis may read as a relatively mechanical activity and would seem to follow a logical progression. In practice however, it is more a craft based artistry (Wengraf, 2001) that provides the field of radiography with a 'new way of seeing' (Boyatzis (1998) and therefore understandings its practice. Thematic analysis may also appear to the outsider as if the observations and insights emerge intuitively (Boyatzis, 1998) but this belies the process. Thematic analysis is not an intuitive practice that is undertaken as a linear progression, but involves careful systematic and rigorous analysis that constantly moves to and fro throughout the analytic cycles. This type of cyclical analysis involved alternating between the entire data set, the coded data, the analysis of that data and recording ideas, and potential themes (Braun and Clarke, 2006). Recording the analytical products which are codes, nodes, relationships and themes that emerged during the analysis, is an integral component of thematic analysis and so does not occur when analysis is completed but rather throughout the analysis (Tuckett, 2005; Braun and Clarke, 2006). The emerging interpretations and decision trail of the researcher throughout the data collection and analysis phases of the research journey were recorded in a reflective journal as recommended by Koch (1998).

Reflective Journal

The reflective journal for this study recorded possible sources of bias for the researcher, methodological decisions, and the researcher's trail of decisions along with the results of discussions with supervisory team. Maintaining a reflective journal effectively 'signposts' the research product enabling a reader to follow the research process (Koch, 1998a). The following extract is included as an example from the reflective journal that records the thoughts of the researcher and the decision making trail that lead to a realisation that radiographers' interactions with referrers appeared to constitute some sort of game and that this might have its foundations in culture.

I think that there is a historical basis for the way communication has evolved. In the beginning the people taking the X-ray also diagnosed because they were the only ones that had any real idea about what was represented in any given image. They developed not only the knowledge of what each shadow represented but also the language to describe the images because this was a whole new field the language did not exist. I haven't got a handle as yet on why medicos took over interpretation if it was just medical dominance. Why would they want it? In the early days taking and developing X-rays was messy and dangerous. There is some interesting stuff in the literature about medicos taking over interpreting and it being assumed because they are a doctor (not radiologists) that they know what they are looking at, this is from the early days and also recently with comparative studies with radiographers. In 1924 the Society of Radiographers in the UK, under pressure from medicos, said ...neither shall such member make any report or diagnosis on any radiograph or screen examination. So radiographers lost the right to diagnose. Radiographers and it seems some of their patients believe that there is legislation in Australia that prevents them from disclosing a diagnosis to the patient. There is also something going on around interpretation of images for referrers why do they play a game. Is it due to hospital based training and so a cultural thing, like nurses?

The reflective journal was also maintained in recognition that a researcher brings to the research not only the data that has been generated but also a positioning within the literature, a positioning of herself and the research context (Koch, 1998a). Therefore, in line with the recommendations of Hansen paraphrasing Grbich (cited in Hansen, 2006, p. 48) where it is recommended that the researcher document their own biases and assumptions in order for the reader to evaluate the impact of the researcher's assumptions, it must be recorded in this case that the researcher was a rural radiographer, a practitioner/researcher.

The researcher as a rural radiographer

As a rural radiographer, the researcher was aware that she brought to the study her own previously existing values and constructions of rural radiography. Although the goal of the researcher within the social constructionist paradigm is as much as possible to rely on the participants' views of the situation under scrutiny, the researcher must acknowledge that their interpretation follows from their own experiences within culture and history (Creswell, 2003). Within a social constructionist study the researcher engages in a dialogue with the participant and, as a consequence, becomes an active contributor to the knowledge produced (Koro-Ljungberg, 2008). As Lincoln and Guba (1985, p. 302) recognised, no one enters into a research site '...in a mindless fashion...'. The researcher cannot therefore be considered external to the construction of knowledge (Koro-Ljungberg, 2008). A practitioner/researcher brings an added dimension to a study. The practitioner/researcher can offer a unique perspective because they have a greater understanding of the culture being studied (Smyth and Holian, 1999; Kanuha, 2000; Coghlan and Casey, 2001).

According to Kanuha (2000), the practitioner/researcher views the project from an emic perspective which confers a subjective and informed standpoint. The researcher's perspective as an insider also allows for insight beyond that available to an outsider (DeLyser, 2001). Furthermore this perspective offers the practitioner/researcher the opportunity to 'gather a greater depth of data and the possible availability of more contextual detail' (Hewitt-Taylor, 2002, p. 35).

It is not possible to describe or explain everything that one "knows" in language; some things must be experienced to be understood.
(Lincoln and Guba, 1985, p. 195)

As this quote by Lincoln and Guba reveals, there is value in being a practitioner/researcher. The value of researcher prior knowledge and understanding is also supported by Hansen (2006). Whilst it is the task of the qualitative researcher to maintain an open mind so as to not predetermine the findings of a project, they cannot help but be swayed by the social location (Minichiello et al., 1999a). The intent as a researcher is to inform the reader of the patterns of behaviour of the group under study because part of the task of a researcher is to communicate the analysis of observations to others (Vidich and Lyman, 1994).

A significant challenge facing the practitioner/researcher is the way that their knowledge of practice and identity as a practitioner may affect data collection and analysis (Reed, 1995). The research design however incorporated strategies to ensure the trustworthiness of the study. For example, the questionnaire was written by a cultural insider, which has been suggested may introduce bias; however the introduction of semi-structured interviews provided a way to reduce the presumed bias by operating within the assumption that the informants' responses cannot be predicted in advance (Wengraf, 2001). A further complication of practitioner/researcher interviewing can be the informants assuming that the researcher already knows the answers to the questions posed (Kanuha, 2000; DeLyser, 2001; Breen, 2007). The assumption of knowing required clarification so that the researcher introduced probes into the interviews in order to uncover richer and more intricate data than could be presumed (Kanuha, 2000).

The researcher's position as a practitioner/researcher also impacts upon what is seen and what is unseen, what is determined as important and unimportant within the data (Breen, 2007). The flexibility of thematic analysis means that some will see within the data what others fail to see (Boyatzis, 1998). This is not to infer that data analysis proceeds with unchecked bias, but rather that pre-understanding allows the practitioner/researcher to see beyond the 'window dressing' (Coghlan and Casey, 2001, p. 676). It was this position as a practitioner/researcher that allowed the researcher to view the study from an emic perspective and allowed for a subjective and informed standpoint (Kanuha, 2000). This emic perspective provides greater depth to the data with corresponding contextual detail (Hewitt-Taylor, 2002, p. 35).

It has been proposed that being a practitioner/researcher introduces the risk of bias (Hewitt-Taylor, 2002). This issue of bias is also raised by Skeil (1995) and Reed (1995), but these same authors and others put forward a strong defence for the practitioner/researcher. There is a presumption that detachment reduces bias; however Paton (2002, p. 49) debunks this idea of detachment as a solution to bias by revealing that ‘...qualitative methodologists question the necessity and utility of distance and detachment, asserting that without empathy and sympathetic introspection derived from personal encounters, the observer cannot fully understand human behaviour’. It is the emic perspective of a practitioner/researcher that provides greater insight into the practitioner’s world than that of a detached cultural outsider (Smyth and Holian, 1999; Kanuha, 2000; Coghlan and Casey, 2001).

Several significant contributions towards understanding the world are derived from scientists’ personal experiences (Patton, 2002). Reflecting on the history of radiography as outlined in chapter one gives cause for thought: radiography exists today because, on 8 November 1895, Wilhelm Röntgen personally observed ‘the bones of his living hand projected in silhouette upon the screen’ (Glasser, 1995, pp. 1033-1034). It was Röntgen’s personal experiences that led to his discovery of X-rays which provided the foundation on which radiography is based. The paradox with practitioner/researcher research is that the relationship enhances trustworthiness while at the same time threatening the trustworthiness of the study (Sandelowski, 1986). The strategies employed to ensure the trustworthiness of the study are outlined in the following section.

Establishing trustworthiness of the study

Interpretative research based on the accounts of the interview participants, such as undertaken in this study, required the establishment of rigour (Koch, 1998b). There are various strategies available to enhance the reliability of the findings of qualitative research and protect against bias (Mays and Pope, 1995). Four criteria for establishing rigour in qualitative research are confirmability, transferability dependability and

credibility¹⁰⁶ (Lincoln and Guba, 1985; Hansen, 2006; Teddlie and Tashakkori, 2009). Each of these four criteria was addressed for this study and the methods employed to ensure rigour are outlined in the following.

Confirmability

Confirmability requires that the researcher provides evidence of reflective analysis, a description of the analytical processes and the provision of data to support arguments (Hansen, 2006). Pivotal to confirmability is auditability. Auditability is arrived at by description and justification where the researcher leaves a clear decision trail (Sandelowski, 1986), so that ‘analysis of the interview data holds up an unblemished mirror to the respondent’s...world’ (Andrews et al., 1996, p. 442). Auditability was achieved in this study with the researcher’s maintenance of a reflective journal, a research journal¹⁰⁷ and the inclusion of supporting data within the body of the thesis. Confirmability of the data analysis has been demonstrated throughout chapters 5 and 6 as the appropriate and supportive field literature has been included alongside the presented data because, in studies such as this one where only two data collection techniques are employed, ‘...it is very important to use the literature to provide support for the findings’ (Williamson, 2006, p. 89). In this study which is situated within the interpretive paradigm, it is recognised that meaning is a human construct, where not only is meaning socially constructed but it is also contextual. The auditability of this study has been established by the outlining of a decision trail in the reflective journal that would enable another researcher to arrive at comparable results¹⁰⁸ given the ‘...researcher’s data, perspective and situation’ (Sandelowski, 1986, p. 33). The reflective journal includes records of the examination, verification and interpretation of the research process, because it is acknowledged that in reflective research the researcher is part of the research, they are in the context and culture that they are attempting to study (Liamputtong and Ezzy, 2005).

¹⁰⁶ Lincoln and Guba use the term trustworthiness to encompass these four criteria (Teddlie, C. & Tashakkori, A., 2009).

¹⁰⁷ The research journal was a chronological record maintained for the duration of the study and contained records of the progress of the study, deadlines, meetings with supervisors and notes from these supervisory meetings.

¹⁰⁸ Sandelowski (1993, p. 3) warns that ‘...no two researchers will produce the same result; there will inevitably be differences in their philosophical and theoretical commitments and styles’.

Transferability

Transferability is a difficult concept with regard to qualitative research. Lincoln and Guba (1985) go so far as to suggest that in the literal sense, transferability is impossible in qualitative research because the results of qualitative research are infrequently generalisable (Hansen, 2006). This research does not seek to provide some sort of universal truth, but rather employs the interpretative approach in order to provide deeper understanding of rural radiography. This concept is supported by the following:

I draw on my data in order to illuminate and concretize theoretical ideas and arguments, not to present empirical proof.
(Engstrom, 1995, p. 396)

As suggested by Engstrom the purpose of this study was to illuminate aspects of rural radiographic practice by presenting the data. This research, which had a largely qualitative component, drew on small purposeful samples (Hansen, 2006) and was situated in both context and time (Lincoln and Guba, 1985). This study took place between August 2007 and May 2010 and drew participants from rural New South Wales, Tasmania and Western Australia. It is therefore not possible to transfer the results from this study to the wider rural radiographic population because what makes the generalisability of qualitative research difficult is the contextual nature of such research (Lincoln and Guba, 1985). With regard to qualitative research and transferability, the onus is on the researcher to provide the study context, methods and results to enable others to decide the applicability of the research to other similar circumstances and so decide if the research is transferable (Lincoln and Guba, 1985; Hansen, 2006).

Dependability

Dependability has been achieved in this study again by maintaining a reflective journal and by the inclusion, when appropriate, of the rationale behind decisions within the text of the thesis because dependability is intrinsically linked with transparency (Hansen, 2006). In order for research to be considered to have dependability, there must be a clear decision trail to provide explicit detail of the theoretical, methodological and analytical choices made throughout the study (Koch, 1994). The decisions made by the

researcher in this study have been recorded in the reflective journal and in part incorporated into the final research product (Koch, 1998a).

Credibility

A research strategy requires credibility (Patton, 2002), where credibility in this study of rural radiographers refers to the degree to which the findings and interpretations of the study adequately represent the constructions of rural radiography by rural radiographers. Findings and interpretations that are based on the data collected in a study are inferences (Teddle and Tashakkori, 2009). An inference is credible when ‘... there is a correspondence between the ways the respondents perceive social constructs and the way the researcher portrays their viewpoint’ Mertens (cited in Teddle and Tashakkori, 2009, p. 295). It is the careful documentation from the various interviews that enhances the credibility of the data collected (Grbich, 1999). Credibility requires that the researcher adopts a position of neutrality with regard to the study (Patton, 2002). The criterion of neutrality refers to the findings themselves rather than the objectivity of the researcher (Sandelowski, 1986). Neutrality does not mean detachment (Patton, 2002) but rather that the researcher adopts a neutral position by not imposing his/her own preconceptions to data collection and analysis (Appleton, 1995). This has been achieved by the use of an inductive approach to data analysis which means that any identified themes are linked to the data itself (Patton, 2002; Braun and Clarke, 2006), and that the data is not coded according to the researcher’s preconceptions into pre-existing codes. A study is credible when it ‘...presents faithful descriptions’ (Koch, 1998b, p. 1188), when the reader can recognise the experience (Koch, 1998b; Hansen, 2006). Credibility in this study will be supported if rural radiographers can recognise their own experiences in the accounts provided by their professional colleagues.

Summary

Chapter 4 has documented the research design and data collection methods used in the study. Achieving the aims and purpose of the study was best served through the analysis of both quantitative and qualitative data collected through questionnaires and subsequent semi-structured interviews. The data collection methods were also appropriate for a study situated within the social constructivist framework. The research design and methods adopted for this study supported the capture and analysis

of data to make sense of the socially and culturally shaped understandings that rural radiographers have of radiographic interpretation, communication and disclosure. The study's quantitative and qualitative components have been drawn together to provide insight into the social world of rural radiography, to construct meaning and interpret rural radiographers' experiences of radiographic interpretation and subsequent communication and disclosure of their radiographic opinion. The analysis and interpretations of the interview data, along with supporting data from the questionnaire, are presented in the next two chapters. In telling the story of the data these chapters reveal the complex and humanistic nature of working in the rural environment through the voices of the rural radiographers.

Chapter 5: Radiographic interpretation, communication and disclosure of radiographic opinion: the pre-conditions.

Introduction

Rural radiographers are operating in the in-betweens, that no man's land that exists at the fringes of one's own established and recognised professional practice and that of the next, adjacent healthcare professional, that murky territory into which patients may fall and become lost. In response to rural radiographers' understanding that patient care may be at risk, radiographers traverse this no man's land. In finding their way through this murky territory radiographers, operating within ambiguous legal and ethical guidelines, have by necessity adopted convoluted and contextually bound strategies as they navigate this complex space with patients and referrers. This space contains the preconditions for the professional decisions about communication and disclosure that rural radiographers make and provides the context in which they practise every day. The findings chapters explore the no man's land in which radiographers interact where the research methods adopted for this study have unearthed the experiences, incidents and interactions related to interpretation, communication and disclosure that have shaped rural radiographers' practice world.

Rural radiographers' involvement in radiographic interpretation, subsequent communication to referrers and disclosure of their radiographic opinion to their patients as raised in the review of the literature, was in turn supported by the results of the questionnaire. The analysis of the questionnaire data revealed that rural radiographers are indeed undertaking radiographic interpretation and participating in communication of their radiographic opinion, with 88.3% ($n = 53/60$) of the radiographers replying that the referring clinician had asked for their radiographic opinion. The majority of the radiographers revealed that requests for their radiographic opinion from referrers was not a rare event with a frequency of requests ranging from weekly ($n = 25/60$; 25%), daily ($n = 21/60$; 35%) to several times daily ($n = 12/60$; 20%). In addition to requests from referrers, the literature review suggested that patients may question the radiographer for information as to what is demonstrated in a radiographic image (Dimond, 2002). Requests from patients for radiographers to supply their radiographic

opinion was also supported by the questionnaire data, which revealed that 60% (n = 36/60) of radiographers said that the patient asked for their radiographic opinion and 70% (n = 42/60) of the radiographers indicated that they have provided a patient with their radiographic opinion on the films that they had produced. The questionnaire data has therefore provided significant evidence that radiographers are involved in radiographic interpretation, communication with referring clinicians and subsequent disclosure of their radiographic opinion to patients. The free text data provided by the radiographers in reply to the open ended questions in the questionnaire, revealed that radiographers' disclosure to patients does not appear to be without difficulty or complication. It seems that there are several factors that radiographers consider prior to their disclosure. On the basis of the identified occurrence of requests and the difficulties identified, rural radiographers' experience, interpretation and understanding of radiographic interpretation, communication with referrers and disclosure of their radiographic opinion were further explored through semi-structured interviews.

This chapter is the first of the two findings chapters that present the results of the analysis of the data exploring rural radiographers' involvement in radiographic interpretation, communication and disclosure of their radiographic opinion. Rural radiographers' construction of their radiographic opinion is guided by a complex decision making process that does not appear to follow a linear progression of binary variables. As a result of the sophisticated, multilayered decision making process that radiographers undertake, the findings chapters are presented in a way that allows concentration on single aspects of this decision making process in order to permit understanding of the practice world of the rural radiographer.

The first findings chapter reports five key themes that emerged from the data and which can be considered to be the preconditions for rural radiographers' involvement in radiographic interpretation and communication with referrers: they may also be considered to provide the preconditions for radiographers' disclosure to their patients. The identification and management of the diagnostic gap¹⁰⁹ is central to this chapter. The five themes are:

- Beyond the technical

¹⁰⁹ Diagnostic gap is discussed on pages 183 and 248.

- The diagnostic gap
- Strategies radiographers employ for responding to the diagnostic gap
- Factors that inhibit radiographers' actions to close the diagnostic gap
- Navigating the diagnostic gap with referrers.

Although chapter 5 presents the results of the analysis of the data around radiographers' communication with referrers, this does not infer that radiographers communicate with referrers before they disclose to patients. Rural radiographers may disclose their radiographic opinion to the patient before a referrer is aware of the results of the radiographic examination:

RR 1 Well he came and had his X-ray and I looked at the first film, oh you've got a fracture here and anyway so I went out to him and it was really unstable and I said ... I am sorry sir but it's not good news I've got to ring the doctor but don't move.

For pragmatic reasons the findings from the analysis of the data around rural radiographers' communication is presented in the first findings chapter. The second findings chapter is wholly concerned with the ways in which rural radiographers make decisions around disclosure of their radiographic opinion to their patients. These themes do not exist in mutual isolation in rural radiographic practice but have been discriminated between for the purpose of analysis and understanding. In these chapters each key theme is presented and described in turn, together with its supporting themes and relevant sample quotations drawn from the rural radiographer narratives along with relevant data from the questionnaire.

Beyond the Technical

Patient welfare is central to rural radiography¹¹⁰. The technical skills of the radiographer have been discussed, but the technical skills of radiographers are applied to people (Tress, 1991) meaning that radiographers operate within dichotomous roles as both a technician and a carer (Dowd, 1992). The centrality of the patient to the radiographer is succinctly described by Polworth who argues that '...the patient is the number one purpose for [the radiographer's] working existence' (Polworth, 1982,

¹¹⁰ The centrality of patient welfare is discussed on pages 96, 263 and 294.

p.101). Furthermore, care for the patient is compounded for rural radiographers as the people who present for a radiographic examination, in addition to being patients may also be friends¹¹¹ (Sigsby, 1991; Dwyer, 1996; Turner et al., 1996; Glover, 2001; Ozolins et al., 2004). It is the centrality of patient welfare to rural radiographers that sees radiographers move from the documented position description as an acquirer of radiographic images, to a healthcare professional who uses both the art and science of radiography to ensure that a patient ultimately receives the best outcome from their radiographic examination. The way in which the radiographers understand their role transcends the mono-dimensional technical focus that predominates in the literature and instead embraces a rich, humanistic patient focussed role that is played out as complex social interactions.

Radiographers' actions and reactions can be seen to be a direct result of the way in which they construct their role around the centrality of patient welfare as the following excerpts demonstrate.

RR 4: ...I think the reason I enjoy radiography...is because I like to feel that I am giving the patient what they need at that point in their treatment or their ... investigations. I like the patient contact where the patient will get up off the table after you have done the most awful things to them and feel that they have to thank you... if I have an examination where I think that the patient that if they get up off the bed that they can't ... have some sort of conversation with you, ... or can't ask you a question that you try your best to answer then you are not doing them you are not giving them not doing your duty not giving them what they deserve.

RR 9: to manage the patient so ... I think it is very important that you are aware that this could be the position that you are in and if you are not happy with it well that's ok if you are not happy with it you can do the best that you can but if you really are happy with it I can't see any problem in going all out and doing what you can to help the management of those patients.

The participant radiographers' sentiment of the patient as central to radiography as indicated in the preceding excerpts is clearly supported by the field literature (Polworth, 1982; Lam et al., 2004). Polworth (1982) writes at length about the complexity of the patient-radiographer relationship as a significant interpersonal

¹¹¹ Issues surrounding rurality are discussed in chapter 1 on page 58.

component in the professional role of the radiographer. The radiographers' use of language such as *giving the patient what they need, I like the patient contact, duty and not giving them what they deserve, going all out and doing what you can* reveals that rural radiographers centralise the patient and patient welfare to their professional role as a radiographer and see themselves as healthcare professionals rather than technologists who operate technically sophisticated machinery.

While radiographers acknowledge that technical expertise in obtaining high quality radiographic images is crucial for optimal patient care, the driver for this is the humanistic endeavour in ensuring the best for the patient, as is evident in the following excerpt.

RR 4: ...Good films always you know if you can't get good films the reason why you can't get them on the form... minimum radiation, minimum pain to patient, perfect films ... general radiography to get it right ... to do the best for the patient is still a skill it's not push buttons.

In the excerpt above the participant has alluded to the technical nature of radiography with statements such as *minimum radiation* which is the ALARA¹¹² principle and *perfect films* which refers to accurate patient positioning and the acquisition of technically high quality radiographic images. Despite the centrality of the patient, radiography is situated in the middle of technology and therefore can be understood to be a 'technologically-mediated craft' (Baird, 2008, p. 6). While the role of the radiographer may be constructed around their functional role in a technological environment, it is well documented that the role of the radiographer is far more complex and diverse. In his speech to graduating Victorian radiography students in 1991, Professor Brian Tress acknowledged that radiography is vastly different from other scientifically based professions because the material on which the technical skills are based is people and that '(b)eing a brilliant, highly trained technologist is not enough' (Tress, 1991, p. 149). Radiography combines art and science (Allbutt, 2011). A recent contribution to the AIR banner that recognises the complex nature of radiography is the tag line 'Art, Science, Humanity' (Harvey, 2011). Science is the application of the formally acquired radiographic knowledge and application of the 'science' to patient care introduces the art of the rural radiographer's practice world (Gordon, 1988a).

¹¹² ALARA principle is described in Chapter 1 on page 33.

It is the centrality of patient care to their practice that presents radiographers with a dilemma which sees them move from image acquisition into the fields of image interpretation, communication and disclosure as the following comment demonstrates:

RR 1: Possibly, ... because they miss so much and my attitude as over the years is... It's only obvious stuff not, if I wasn't sure I wouldn't say anything but if there is a definite crack there that I am pretty sure the doctor's going to miss, it might show in one view, I will say something to them, because that could be my auntie or my son or my daughter and their wrist's stuffed because of it and I will suffer the consequences. So that's how I ... it's been a few political decisions I've had to make over the years and that's how I've looked at it, what's best for the patient.

This excerpt provides evidence of rural radiographers moving beyond the technical acquisition of radiographic images into radiographic interpretation and communication of that radiographic opinion as revealed in the field literature (Hall et al., 1999; Smith and Lewis, 2002; Cook et al., 2004; Nuss, 2007). The excerpt further reveals the complexity of rural relationships as the social interactions of a rural radiographer and patient may not be confined to the patient-radiographer relationship. Social relationships and the responsibility for image interpretation notwithstanding, the ultimate goal for radiographers' decisions and actions appears to be what is *best for the patient* and it seems that, as Peters (1996) suggests, radiographers are a vital interface between a patient and other members of the medical profession. Rural radiographers acting as an interface is evident when in some instances, radiographers are proactive in the provision of their radiographic interpretation in order to ensure that a patient receives appropriate medical intervention. For rural radiographers it seems that, as suggested by Lam et al. (2004), patient care and advocacy are integral dimensions of radiographic practice.

This excerpt by RR 1 has identified the dilemma that their patient focus presents for radiographers. The dilemma is that, although radiographers may produce a radiographic image, a radiographic image on its own does not ensure a diagnosis—a diagnosis is contingent upon human interpretation of the radiographic image (Manning and Leach, 2002). Therefore, the diagnostic value of a radiographic image may be limited by the errors and biases associated with the human interpretation of radiographic

images¹¹³. Chapter 1 argued that radiographic interpretation and disclosure are not a documented part of a radiographer's job because radiographers are '...responsible for producing the medical images that assist medical specialists...' (Australian Institute of Radiography, 2009) and it is the radiologists who '...interprets images to make diagnoses...' (Australian Bureau of Statistics, 1997, p.158). The literature review presented in chapter 2, however, showed that despite radiographic interpretation falling outside the documented parameters of radiographic practice, rural radiographers are involved in radiographic interpretation, communication and disclosure. What was not apparent from the literature review is why radiographers are motivated to do what is best for the patient, when radiographers have no legal diagnostic duty to their patients (Smith, 2006b). In the interviews, radiographers have offered an insight as to why they are participating in radiographic interpretation.

The participants reveal that, notwithstanding this lack of legal diagnostic obligation, radiographers are participating in radiographic interpretation, communication and disclosure. This participation appears to be a consequence of their perception of their diagnostic responsibility to their patients as the following excerpt demonstrates:

RR 4: However, having said that ... I feel that it is also inherent in the responsibility of whichever position I am in that should I be aware of something that is an abnormality on a film, particularly after hours if there is no radiologist to refer it to or now days it is much easier to do because we are linked by PACS via the web you can get advice from other people that, ... I would need to bring that to the attention of the ... referrer.

RR 9: yes I feel that actually as a professional and my years of qualification and education in this sort of area with you know in this situation a lot of radiologists I find that I feel well I feel it is my duty really sometimes to mention things that I see well I think you have to

The participant radiographers have expressed a sense of *responsibility* and *duty* to ensure that all radiographic abnormalities are identified. A radiographer's action in undertaking to alert referrers to the presence of a radiographic abnormality may be explained in part by the AIR '*Guidelines for professional conduct for Radiographers*,

¹¹³ Error and bias in radiographic interpretation and their potential impact on patient care are discussed in chapters 1 and 2

Radiation Therapists and Sonographers'. These guidelines include, 'The code of practice for radiographers' which contains the following statement:

Radiographers, recognising their responsibility to the patient should alert medically significant findings to the medical personnel responsible for the patient's treatment and at the request of such personnel may provide an opinion that lies within their knowledge and expertise.

(Australian Institute of Radiography, 2007, p. 3)

Clearly the AIR considers that upon identification of a medically significant finding, the radiographer should notify the appropriate medical personnel. However these guidelines are open to interpretation as the AIR does not define 'medically significant', 'knowledge' or 'expertise'. Furthermore the guidelines may only provide a partial answer because, as it was revealed in chapter 1, not all Australian radiographers are members of the AIR and so may not be privy to, and guided by, such AIR documents. Radiographers' intervention to ensure identification of a radiographic abnormality is more than a professional obligation to ensure adherence to AIR guidelines. Chapters 1 and 2 of this thesis showed the value of accurate and timely radiographic interpretation and how this can positively impact on patient care (Guly, 2001; Ng and Palmer, 2007). In chapter 1 it was revealed that the traditional model for radiology sees the radiologist's interpretation of a radiographic image delivered to the referring clinician as a written definitive report. Chapter 2 however indicated that, despite the ultimate availability of a radiologist's report, many reports may not be generated in time to influence the management of patients (Saxton, 1992; Rudd, 2003; Gibbon, 2005; Queensland Government, 2011). The field literature also revealed that radiographic image interpretation is contested ground because the steps from image acquisition through image interpretation to provision of a report on that radiographic image are not always a simple progression (Smith and Lewis, 2002; Smith et al., 2009b). Although the radiologist is the one who '...interprets images to make diagnoses...' (Australian Bureau of Statistics, 1997, p.158) and who is the traditional provider of reports on these same radiographic images (Reed 2002), both the data and the literature demonstrated that significant time delays may exist between image acquisition and the availability of a report to the referring clinician.

The Diagnostic Gap

Time delays in the provision of a report can impact on patient care. The provision of an accurate radiographic interpretation at the time of the patient's presentation has the potential to inform patient treatment and significantly improve patient outcomes (Guly, 2001; Ng and Palmer, 2007). The diagnostic value of a patient's radiographic image examination is governed, not by the time taken for the referrer to receive the radiologist's report, but in the time taken for the referrer/treating clinician to be aware of a diagnostically accurate interpretation of that patient's radiographic image and the significance of this interpretation with regard to diagnostic impact, therapeutic impact and the impact on the patients' health. The time from image acquisition until the referrer is in possession of a diagnostically accurate interpretation of a patient's radiographic image, which they are then able to act upon and pass onto their patient, is referred to in this study as the *diagnostic gap*. The diagnostic gap is not simply the time taken for the referrer to receive a radiologist's report but rather the time that elapses before a referrer is aware of what such a report might indicate. This distinction needs to be noted, but the concept of the diagnostic gap is further complicated because in some instances, the first time a referrer might become aware of a radiographic abnormality is upon reading a radiologist's report. The diagnostic gap is contextual and, as a result of the variability of contributing factors, it is both dynamic and elastic. Three factors – (i) the delay in reporting, (ii) perceived health professional inadequacies in image interpretation and the priority assigned to a patient as a result of (iii) radiographers triaging patients based on their radiographic images – contribute to radiographers' assessment of the diagnostic gap. Each of these factors is described in turn and its impact on the diagnostic gap is discussed.

(i) Delay in Reporting

Delay in reporting represents the maximum parameters of the diagnostic gap, occurring in instances where the first time a referrer is aware of a radiographic abnormality on a patient's radiographic images is upon reading a radiologist's report. The participants reported several factor dependent delays in the availability of the radiologist's report

and the following interview excerpts show these delays can range from a zenith of within two hours for day work to the following morning for out of hours work.

RR 6: In that ... our report turn around well the benchmark for our report turnaround is that 95% of what happens during the day the report is back within the two hour turn around.

RR 7: No, no nothing happens instantaneously in the country we only have two sites with resident radiologists

RR 2: ...the radiologist reported them in the morning.

The participant radiographers have indicated that the factors that influence turnaround time between image acquisition and availability of a radiologist's report are the proximity of the reporting radiologist and the time of the day. Radiologists' reports are not generated the moment a radiographic image is acquired: hot reporting of radiographic images is not mentioned by the radiographers but rather these are examples of the traditional cold reporting as *nothing happens instantaneously in the country*, which is also indicative of how the rural context may impact on the diagnostic gap. The reporting time for radiographic examinations that take place outside of normal hours of work is increased. The questionnaire data also revealed varying turnaround times, with the usual turnaround time from image acquisition to reporting ranging from same day ($n = 19/60$; 31.7%), through next day ($n = 11/60$; 18.3%) to within three days ($n = 19/60$; 31.7%). For the smaller and remote centres with RRMA classification of Rem1 and Rem2, the best usual turnaround time reported by the rural radiographers was the next day. Similar timeframes were evident in the literature where delays of one to three days between image acquisition and provision of a report to the referring clinician were revealed as common in rural hospitals (Smith et al., 2009b). The questionnaire data also indicated that turnaround time for provision of a radiologist's report is multifactorial due to a range of issues that may impact either positively or negatively on turnaround time. The questionnaire participants indicated four factors that impact on report turnaround time:

1. Computer network connection (Teleradiology),
2. Priority status – according to clinical need, inpatient or outpatient status,
3. Radiologist workload,
4. Availability of radiologist.

The following provides an explanation of how each of the factors listed above impacts on the turnaround times for the radiologists' reports.

- *Computer network connection (Teleradiology)*

Teleradiology, which is a component of PACS, provides a rapidly available digital radiographic image for a radiologist to report on. The advantage of teleradiology is that it can provide radiographic images to locations geographically separate from the site of image acquisition within the very short timeframes permitted by digital equipment.

Teleradiology therefore negates the time required for hard copy images to be delivered to a radiologist, either by the radiographer where the radiologist is on site, or by courier where the radiologist is at a location remote from the radiographer. Therefore where a radiographer is working at a site that has teleradiology, turnaround time for availability of a report may be reduced.

- *Priority status – according to clinical need, inpatient or outpatient status*

Radiographers and referring clinicians may assign a particular patient's radiographic examination a priority based on the referrer's clinical assessment of the patient or upon the radiographer's interpretation of the patient's radiographic images. Where it is determined that the rapid availability of a radiologist's report is required, the radiographer may either draw the radiologist's attention to such a requirement by placing hard copy images at the top of the radiologist's pile of images to be reported, or assigning the examination a priority one on the PACS which indicates to the radiologist that the examination requires an urgent report.

- *Radiologist workload*

The radiologist's workload impacts on report availability time because a radiologist can only report one patient's radiographic images at a time. When a patient's examination has not been assigned a priority, the radiographic images are generally reported in a chronological order that follows from the time of image acquisition, so that the radiographic images from the first patient of the day are reported first. The greater the number of radiographic examinations performed, the greater the workload and the consequential increase in time for reporting.

- *Availability of radiologist*

Having a radiologist on site generally reduces reporting turnaround time, especially when employing hard copy radiographic images, as radiographic image delivery times are significantly reduced. The predicted widening in the gap between supply and demand for radiological services will increase workloads for radiologists, which will in turn make it unrealistic for all radiographs to be reported by a radiologist in a timely manner (KPMG, 2009; Smith et al., 2009a).

Despite there being factors such as those listed above that impact on turnaround times, and the variability in the time for availability of a radiologist's report, in this study 100% of the questionnaire respondents reported that all radiographic images were ultimately reported. The finding of all radiographic images being reported is in contrast to the literature, where it was suggested that some radiographic images remain unreported (Gibbon, 2005; Patty, 2007). The reason for this discrepancy between the data and the literature is not apparent. It has been suggested that the reason that no plain film reporting is occurring in some hospitals is because of insufficient radiologist resources (Gibbon, 2005). It may simply be that in the facilities where the rural radiographers who participated in this study are employed, there are sufficient radiologist resources to ultimately report all radiographic images.

As already stated, all the radiographic images produced by the participant radiographers in this study are ultimately reported by a radiologist. However there are still significant delays in the reporting of some radiographic images. It is these delays in the availability of a radiologist's report that have resulted in radiographic image interpretation increasingly becoming the responsibility of the referring clinician. Various authors have indicated that the different healthcare professionals who may find radiographic image interpretation within their scope of practice exhibit varying levels of skill in detecting radiographic abnormalities (Vincent et al., 1988; Taheri, 1999; Guly, 2001; Benger, 2002; Willis and Sur, 2007). The varying levels in radiographic interpretation skills held by referring clinicians has not escaped rural radiographers' notice and it is this factor that appears to add another dimension to rural radiographers' estimation of the diagnostic gap.

(ii) Perceived health professional inadequacies in image interpretation

The participant radiographers are acutely aware of the varying skill levels, and in particular the low level of radiographic image interpretation skill, held by some healthcare workers as the following comments illustrate:

RR 1: But in like, in (RRMA 5 hospital), I don't know what the doctors are like now, but, up there but, some of them are really good and others haven't got good skills in reading X-rays and they miss things.

RR 7: If it was a kid's wrist or an arm the doctor might look at it we do get an awful lot of overseas doctors not that they are not good but we do get a lot of overseas doctors who may not have a lot of radiology experience and I might point out and say look it looks like there is something on that cortical there is a bulge in the cortex or that looks like a fracture or whatever just keep the child or back slab or whatever you want to do but let me send this off for an urgent report

This finding is supported by Smith (2008, p. 318) who, in reference to junior doctors and general practitioners, reveals that '...they miss abnormalities, delaying treatment and decreasing the quality of care'. The literature revealed that seniority and experience are associated with radiographers' ability to accurately interpret radiographic images (Anderson et al., 2006) and it seems that the participants also attribute seniority in medical staff to accurate radiographic interpretation.

Just as Smith (2008) has indicated that it is junior doctors who miss things, limited experience and youth of the referring clinicians were the outstanding features of radiographers' explanations for referrers' inadequate skill in radiographic interpretation as the comments below illustrate:

RR 4... Working in a hospital situation I am sure you remember a lot of the doctors after hours are junior doctors.

RR 8: ...a lot of the times the GPs are younger than we are and haven't, don't have the experience you know what I mean.

The concept of junior doctors possessing limited radiographic interpretation skills has been recognised (Taheri, 1999; Smith, 2008). Accident and Emergency departments in particular are very often staffed by junior doctors (Guly, 2001; Saunders,

2012; Queensland Government, 2011). The concern that arises from such staffing arrangements is that the misreading of radiographic images is a leading cause of diagnostic error in Accident and Emergency departments (Smith et al., 2009b). In this study radiographers seemed to have a limited tolerance for referrers with inadequate image interpretation skills. Consider the following excerpt where RR 1 expresses astonishment at a referrer's inability to identify fat pad sign¹¹⁴ in an elbow radiograph.

RR 1: as well they'll ... you get all these young doctors and they don't even see fat pads in elbows so they send patients off and...

The participant radiographer's limited tolerance for a misdiagnosis may be explained in part because of the impact on the patient. For example, the inability to identify the fat pad sign in an elbow, where this may be the only indication of fracture or significant injury, could result in a patient being misdiagnosed as having no significant injury of the elbow leading to a delay or failure in the diagnosis of a fracture and possibly causing an increase in functional disability for that patient (Hyland-McGuire et al., 1997). This thesis has already shown that perception precedes interpretation and that both of these steps are prone to error. The consequence of misinterpretation of a radiographic image due to either error of perception or error of interpretation, may be an error in diagnosis for that patient. Errors or delays in diagnosis have implications for patient care (Hyland-McGuire et al., 1997; Guly, 2001; Summerton, 2011) and this presents a dilemma for rural radiographers as they have constructed a great deal of their practice around what is best for the patient. A delay in the availability of an accurate radiographic interpretation of a patient's radiographic images means that the patient is in a diagnostic limbo: a radiographic image is not a diagnosis, since diagnosis requires radiographic interpretation. It is this time delay that exposes the patient to the risks associated with a delayed diagnosis. Radiographers have expressed a duty to ensure a referrer becomes aware of an abnormality on a radiographic image. The answer to why radiographers believe that they need to

¹¹⁴ Fat pads are a subtle radiolucent soft tissue shadow that may be identified adjacent to the distal humerus in the radiographic image of a lateral elbow projection. A fat pad in the elbow is a collection of tightly packed fat cells that are surrounded by fibrous tissue septa (Anderson, K. N. (ed.) 1994) that lies adjacent to the elbow joint. There are three fat pads that may be visualised in the elbow – the anterior fat pad, the posterior fat pad and the supinator fat stripe. As a result of injury the synovium membrane surrounding the elbow secretes synovial fluid and this causes distension of the fibrous capsule of the joint (McQuillen-Martensen, K. 1996). Distension of the fibrous capsule causes displacement or an alteration in shape of the adjacent fat pad which, when visualised on a radiographic image, indicates a joint effusion and the possibility of fracture (ibid.).

communicate their radiographic opinion may be the gap in time between image acquisition and the availability of the radiographic interpretation and the impact this can place on patient care. While the diagnostic gap is a period in time, there is another factor that the radiographers apparently consider in their assessment of the diagnostic gap; radiographers also prioritise the importance of the abnormalities they are seeing on the radiographic images.

(iii) Radiographers triaging patients based on their radiographic images

The participants indicated that they prioritise the importance of an identified radiographic abnormality by triaging¹¹⁵ the patient based on the potential consequences to the patient of that radiographic abnormality. Consider the following excerpts that illustrate how the radiographer assesses that a particular radiographic abnormality may necessitate urgent medical intervention.

RR 2: Yep. Whereas I mean, you know something, a bad fracture or something needs to be treated straight away someone with advanced cancer or whatever, even if I told them at four o'clock in the afternoon nothing, even if the doctor knew, the doctor can't do anything can he.

RR 1: This guy came in one day and he had been in a car accident and he rang his doctor and he said my neck's really sore and the doctor said oh come by the surgery and pick up a request and go and have an X-ray. Well he came and had his X-ray and I looked at the first film, oh you've got a fracture here and anyway so I went out to him and it was really unstable and I said ... I am sorry sir but it's not good news I've got to ring the doctor but don't move.... within about 5 minutes there were about 12 people in the room trying to get him from sitting up to lying down because we had to put collars on and then get him down without him moving anyway he had a halo on two days later and was walking around again.

In the preceding interview excerpt the participant has identified a fracture to one of the seven cervical vertebrae which can have significant consequences for the patient. At the time of the examination this patient was well enough to be ambulatory and the only symptom revealed was neck pain. However RR1 has revealed that the fracture

¹¹⁵ Triage is the classification of casualties according to the gravity of their injuries and the urgency of the treatment that they may require. (Anderson, K. N. (ed.) 1994.)

*'was really unstable'*¹¹⁶. The initial step for radiographers in triaging radiographic images is that they must first make a radiographic interpretation of the radiographic image. The literature has suggested that, despite a lack of formal training, radiographers are competent in radiographic image reading (Hall et al., 1999; Price, 2001; Gibbon, 2005; Brealey et al., 2005) with a radiographic interpretation skill level as high as 95.5% (Berman et al., 1985). Triaging a patient is not only reliant on competence in radiographic image interpretation. Triaging the patient according to their radiographic images involves consideration of the diagnostic impact of that interpretation. In the excerpt above the radiographer has assessed this patient to be at significant risk due to his injuries and rapidly set in motion a process to both prevent further injury and initiate appropriate treatment. In this case, as well as alerting the doctor, the radiographer has indicated to the patient that the radiographic image indicated the presence of a radiographic abnormality. Although the radiographer's language to the patient was not specific, the intent appears clear. The radiographer has prioritised the injury and alerted the patient to the presence of a radiographic abnormality in order to ensure that the patient did not incur further injury to himself by moving and has then telephoned the referrer.

Some participants indicated that they are alerting a referring clinician to a significant radiographic abnormality in order to ensure appropriate steps in patient management are undertaken; others are moving beyond this diagnostic step. The following excerpts show how some of the participants suggested that they are also assessing treatment options for the patient.

RR 7: So if we got a neck of femur up here they would pick it up say for example they didn't... I would say to them I think that neck of femur looks abnormal I am sending the films off you might like for me to send them down to the flying doctors cause we are going to fly this one out...I know they don't do hip pinnings up here...I would say do you want me to send these down or do you want me to wait for the report?

¹¹⁶ Vertebral fractures are often unstable and soft tissue damage may still result (McConnell et al., 2005). Any action that exacerbates the injury, such as head movement, could result in spinal cord injury which can unleash a chemical and metabolic sequelae that leads to cord swelling (Boss, B. J. 1998). Spinal cord injury may also result in a loss of motor and sensory function the extent of which is dependent upon the level and nature of the injury (ibid.). Cord swelling in the cervical region can be life threatening as the phrenic nerves that control the diaphragm receives its major input from nerves that exit at the cervical vertebra 3 and 4, which may lead to paralysis of the diaphragm (Marieb, E. N. 2001). Cervical injury also has the potential to result in quadriplegia if the level of injury is above the sixth cervical vertebra (Boss, B. J. 1998).

RR 2: Pneumothorax, ... fractures... probably like chest infections, pneumonia that sort of thing. If I have a patient where I look at the films and there is a chest infection or pneumonia there and I say to them when are you seeing the doctor again, oh I am seeing him tomorrow afternoon but he gave me antibiotics you think right that's fine, I will still put a priority on it but I might make a note of that on the screen, patient on antibiotics, seeing doctor tomorrow.

The excerpt by RR7 may be understood because rural and remote hospitals cannot provide the range of services that are available in a major centre as they may not have the 'critical mass' in terms of population and infrastructure to support resident specialists such as orthopaedic surgeons (Productivity Commission, 2005). A lack of appropriate local infrastructure would require the patient being transferred to a hospital with orthopaedic facilities. The excerpt by RR2 can be understood when the prognosis and treatment for pneumonia is considered. Pneumonia is a potentially fatal, acute infection of the lungs that may be viral or bacterial in origin. The radiographic image has therefore revealed that the patient is in need of appropriate and timely medical treatment. The radiographer has, therefore taken steps to ensure that the referrer comes to possess a radiographic diagnosis as a matter of urgency. Although these excerpts are of particular clinical situations that the radiographers have encountered, and clinical explanations have been provided to give some understanding of the radiographer's behaviour, these excerpts potentially reveal more than what radiographers do when encountering fractures and patients with pneumonia. These examples demonstrate that radiographers are making sophisticated clinically and radiographically based assessments of their patients where the overriding drive for their decision appears to be based upon what is best for the patient. In the preceding section the participants were triaging the patients in order to assess the impact of the diagnostic gap on the welfare of the patient.

It appears that a radiographer's identification of the diagnostic gap, along with the centrality of patient welfare, is strongly wedded to their perception of diagnostic responsibility and it is this in turn that drives rural radiographers to undertake strategies in an attempt to close the diagnostic gap. Given the contextual, dynamic and elastic nature of the diagnostic gap, it seems radiographers are utilising strategies to control factors that contribute to its variability.

Strategies radiographers employ for responding to the diagnostic gap

The diagnostic gap as it was defined earlier in this chapter is the time from image acquisition until the referrer is in possession of a diagnostically accurate interpretation of a patient's radiographic image. The significance of the diagnostic gap is that it is not until the referrer is in possession of a radiographic interpretation that he/she can initiate any necessary treatment based upon that radiographic interpretation. The welfare of the patient is at risk when there is misinterpretation or a delay in image interpretation, and it seems that this concern for patient welfare is responsible for rural radiographers employing strategies to respond to the diagnostic gap. Any strategies that a radiographer can employ to reduce the time between image acquisition and the referrer being in possession of a diagnostically accurate interpretation of a patient's radiographic image will effectively begin to close the diagnostic gap and improve patient care. The findings indicate that radiographers employ two strategies as they attempt to close the diagnostic gap: firstly, radiographers employ strategies for alerting the radiologist, and secondly they employ strategies to alert the referring clinician.

The strategies that radiographers employ to alert the radiologist

It is delays in reporting that present the maximum possible parameters to the diagnostic gap and so reducing reporting turnaround time between image acquisition and receipt of a radiologist's report will assist in minimising the diagnostic gap. The following excerpt shows that one approach radiographers use to reduce the diagnostic gap is to attach a physical indicator to the radiographic images to notify the radiologist that the radiographic images require an urgent report.

RR 3. ...mark the films urgent

RR 4. ... you can indicate on your completion of your patient they need an urgent report to go out

In medical imaging departments where the radiographers and radiologists work with film and paper, tangible clues help the radiologist prioritise their work (Morgan and Chang, 2005). Alerting a radiologist to the necessity of an urgent report based on

the radiographer's assessment of the radiographic images, sees that particular patient's images move to the front of the reporting queue. In medical imaging departments that employ hard copy radiographic images, marking the films as urgent could be a physical note such as a *post it note* attached to the patient's referral form that sits with the radiographic images awaiting reporting by the radiologist. In a medical imaging department where digital image storage systems are used, the radiographer assigns the patient's radiographic images as a priority on the PACS to ensure that the radiologist is alerted to the need to report these images as a matter of urgency, as the following comments demonstrate:

RR 2: ...I have looked at the films and one of them had a massive pleural effusion on the right side, no air at all...yeah but that was another case of where I saw that, put a priority on it because I mean the man couldn't breathe for a start but also you knew that something was happening in there that needed investigation. I think it ended up being mesothelioma.

RR 7: Send them down with what we call a priority one

Alerting a radiologist to a radiographic examination requiring an urgent report by assigning that examination a priority on the PACS is a recognised mechanism for radiographers to employ (Morgan and Chang, 2005). On becoming aware of the priority, the radiologist will in turn dictate a report on that examination as a matter of urgency. Assigning a radiographic image as a priority one however, does not necessarily result in an instantaneous report becoming available to the referrer as illustrated by the following excerpts:

RR 2: But sometimes it's right and that's the hard thing and the more that you've been in practice the more that you know that it's not a perfect world and if you send a patient away with a fracture, even if you put a priority on it some of them get missed and the doctor's left for the day when it gets faxed back to the clinic and all those things happen because it's not a perfect world.

RR 7: and say we are sending it as a priority one and the report is guaranteed to be back within an hour

Assignment of a priority one to a patient's radiographic images may still result in a significant delay in availability of a report so this method is not without its limitations. In cases of delay in reporting, rapid intervention based on accurate

radiographic interpretation is in the hands of the referring clinician. A contributing factor to the diagnostic gap is referrers' varying, and sometimes limited, radiographic interpretation skills. A method that radiographers employ to provide some compensation for a referrer's potential limitation in radiographic interpretation is to indicate to the referring clinician the existence of a radiographic abnormality using the red dot¹¹⁷ system.

The strategies that radiographers employ to alert the referring clinician

The participants indicated that they are providing some compensation for a referrer's potentially limited radiographic perception and interpretation skill by indicating to the referring clinician that they have identified a radiographic abnormality by affixing a red dot to the patient's radiographs or the film packet containing the patient's radiographic images. The participant radiographers' use of the red dot is illustrated in the following excerpt:

RR 6: ... no we have what I would assume a lot of places have a red dot system...in that you know if there is an abnormality in the films then we will red dot them and they can either come around and say what does that mean, does it mean what I think it means or tell me what it means ... and then they may well seek further advice after that but if the opinion is not sought then we just don't hand it out because we can...yep a red dot on the front draws it to their attention pretty well. And we conduct audits from time to time and it is rare, we do them every quarter and it's rare that we drop below 95% in terms of accuracy.

The red dot system is a recognised method for radiographers to employ to alert a referrer to the presence of a radiographic abnormality (Cheyne et al., 1987; Smith, 2006b; Willis and Sur, 2007; Snaith and Hardy, 2008; Saunders, 2012). The system is discussed at length in chapter 2 and, while it presents as a workable option to alerting a referring clinician to the presence of a radiographic abnormality, it is not without its shortcomings.

¹¹⁷ The red dot system and rationale for its implementation is discussed in chapter 2 on page 89.

In this study, the red dot system as a means of alerting referring clinicians to a radiographer-identified radiographic abnormality was mentioned by two radiographers only and their comments are listed below.

RR 1: I got to the stage where I used to put red dots on them, if there was something

RR 6: In that you know if there is an abnormality in the films then we will red dot them.

Only two radiographers out of the nine who participated in the interviews indicated the use of the red dot system, and so it appears that the system may have not been universally adopted throughout rural Australia. Sporadic use of the red dot system in Australia is consistent with the literature (Smith, 2006b) although the reasons for non-use are not identified. Furthermore, it appears that there is not widespread acceptance of the red dot system by all referrers as the following excerpt reveals:

RR 1: ... But other doctors weren't interested in it and they would send a fractured tibial plateau home and I had a red dot on the film, I'm thinking, (laughter), so I mean this particular patient with the red dot and the tibial plateau fracture that was missed for 6 weeks... his knee is stuffed... I mean I am annoyed with myself that I didn't mention that he had the crack there now because I now I would have...and he came back and he had all sorts of trouble and then they couldn't do anything in the end. And I would say that he has really bad arthritis or a knee replacement now.

Again, the centrality of patient welfare to rural radiographers is evident. In this excerpt, the radiographer's annoyance at the referrer's failure to identify the radiographic abnormality appears to be because a failure to diagnose impacts on the patient as the comment demonstrates '*the tibial plateau fracture that was missed for 6 weeks... his knee is stuffed...*' The participant's concerns expressed in this excerpt are well founded. Errors or delays in the diagnosis of a fracture may result in an increase in long term functional disability for a patient (Hyland-McGuire et al., 1997). An intra-articular fracture such as a fracture of the tibial plateau which occurs at the articular surface of the tibia at the knee can result in impaired function and pain on movement (Mourad, 1998). Although it seems that the referrer's failure to timely identify the radiographic abnormality has impacted on the patient, the red dot system is nonspecific,

as it simply indicates the existence of an abnormality not the nature of that abnormality. The literature has revealed that the red dot system is not widely used in Australia (Smith, 2006b; Smith et al., 2009a) and the idea that a referring clinician may not be aware of the significance of a red dot cannot be dismissed. In any case, tibial plateau fractures may be difficult to detect as they may only appear as a sclerotic line in the condyle (Eyres, 2005) and so concordance of radiographic interpretation might not occur. A referring clinician, therefore, unaware that a radiographer suspects a tibial plateau fracture and, falling victim to perceptual error in radiographic image reading, could either fail to identify or dismiss as not clinically significant the subtle sign of a tibial plateau fracture. As this participant has suggested, the missed tibial plateau fracture may have been overcome if a specific comment regarding the nature of the abnormality had been revealed ... *I mean I am annoyed with myself that I didn't mention that he had the crack.* One of the documented limitations of the red dot system is that it does not allow the radiographer to specify the location and the nature of the identified radiographic abnormality (Payne, 1994; Smith and Younger, 2002).

Despite their attempts to close the diagnostic gap, the participants indicated that its complete elimination is not always possible. Alerting a radiologist to the necessity of an urgent report might still result in delays in receipt of a radiologist report by the referrer that may not be appropriate for the patient's condition. The second strategy of alerting a referrer through the use of the red dot system, may also not be successful because the red dot system is not in use in all centres and, even where it is employed, it might be ignored. The strategies that rural radiographers employ in their attempt to close the diagnostic gap to a point that is appropriate for patient care are not always effective as there are further contributing elements. The elements that impact on radiographers' attempts to close the diagnostic gap are explored in the following section.

Factors that inhibit radiographers' actions to close the diagnostic gap

Rural radiographers' attempts to close the diagnostic gap in order to improve the outcome for their patients are impacted upon by more than the delays in radiologist

reports and the limitation of the red dot system. Rural radiographers' involvement in communication of their radiographic opinion with referrers is based upon radiographic interpretation, an area of practice for which radiographers are rarely formally qualified and for which they receive little or no guidance. This presents as an inhibition to radiographers' attempts to close the diagnostic gap. The informal pathway for the acquisition of the knowledge base which radiographers draw upon for radiographic interpretation, has resulted in radiographers not always being confident in their radiographic interpretation. A further complication of the informally acquired and often implicit knowledge base is that this area of rural radiographic practice is often invisible to the referring clinician. A consequence of this invisibility of rural radiographers' knowledge in radiographic interpretation is that in some cases referrers ignore the radiographer's specific comments on an identified radiographic abnormality. Therefore, the factors that appear to inhibit radiographers' actions to close the diagnostic gap are (i) their informally acquired radiographic interpretation skills, (ii) the fact that radiographers are not always confident in their radiographic interpretation and (iii) referrers may ignore radiographers' radiographic interpretation.

(i) Informally acquired radiographic interpretation skills

In undertaking radiographic interpretation, radiographers are utilising a skill in which they generally have no formal qualification. Radiographers' lack of formal training or qualifications in radiographic interpretation was reflected in the interview data analysis where all the participants acknowledged that they did not possess formal qualifications in radiographic interpretation as the following excerpt demonstrates.

RR 6: Well I suppose you could say it is self-taught really but ... in some respects my time with in private practice taught me that you need to have a bit of an idea about what is going on radiologically speaking...you just accumulate knowledge over a period of time

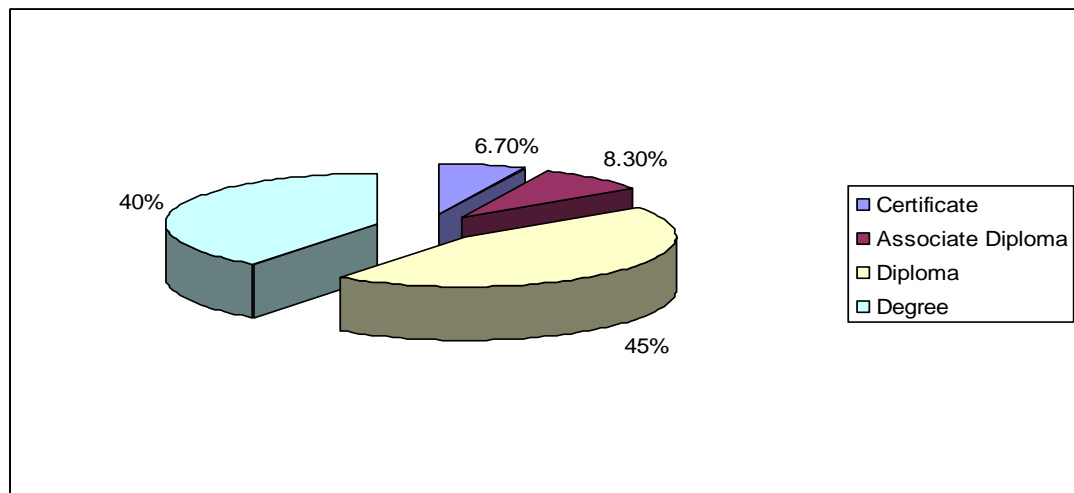
This finding is largely consistent with both the literature, where it was revealed that very few radiographers have been specifically trained in image interpretation (Smith et al., 2009b), and also with the results from the questionnaire where 96% (n =58/60) of the respondent radiographers indicated that they did not have formal qualifications in radiographic interpretation. Analysis of the questionnaire data using bivariate analysis

revealed that the radiographers who indicated formal radiographic interpretation qualifications had acquired those formal qualification as a subject undertaken as part of their undergraduate medical imaging degrees. The first degree in medical imaging was introduced at the RMIT in 1986 (Australian Institute of Radiography, 2009) and radiography education¹¹⁸ did not complete the shift from hospital based training to university based degrees in all Australian states except Tasmania until 1992 (Lewis, 2003). The changes in radiographic qualification that have evolved along with the changes in radiographical technologies throughout radiological history, are reflected in the data collected from the questionnaire. The radiographers who responded to the questionnaire had held their radiographic qualifications for between one and forty-one years with an average of approximately eighteen and a half years. The age of these radiographers along with the number of years qualified covering a period of 40 years has resulted in the respondents holding qualifications that ranged from certificate to degree. Fitting within the timeline¹¹⁹ of radiographic education and qualifications, all of the radiographers who had been qualified for seven years or less held a degree. Those radiographers who had qualified nine to twenty-four years ago held a mix of degrees and diplomas. The radiographers who had qualified, 25 to 27 years ago held either an associate diploma or a diploma and those radiographers who qualified 28 years or more ago held a mix of certificates, associate diplomas and diplomas. The highest radiographic qualification held by the majority of the radiographers was a diploma (n = 27/60; 45%) and the next most common qualification was a degree (n = 24/60; 40%). The breakdown of radiographer qualifications from the questionnaire data is demonstrated in figure 1.

¹¹⁸ Radiography education discussed in chapter 1 on page 36.

¹¹⁹ Timeline for radiographer education is included as Appendix A.

Figure 1 Radiographic Qualification



Although 40% ($n = 24/60$) of the respondent radiographers revealed that they held a degree in radiography, only 3.2% ($n = 2/60$) of the radiographers held formal qualifications in radiographic interpretation as a subject that formed part of their undergraduate medical imaging degree. In addition to their formal interpretation training, the radiographers who indicated a formal qualification in radiographic interpretation revealed that their formal training was augmented by informal training acquired through discussions with radiologists and their radiographic peers. The explicitly acquired radiographic interpretation knowledge learnt through formal pathways by these radiographers appears to have been augmented by informally acquired implicit and tacit knowledge¹²⁰ (Polanyi, 1967; Gordon, 1988a; Pope et al., 2003). While the radiographers who were interviewed revealed that they did not possess formal qualifications in radiographic interpretation, they did acknowledge that they possessed radiographic interpretation skills and that these skills were learnt through their day to day practices as a radiographer.

The following excerpt demonstrates that the participant radiographers' radiographic interpretation skills were experientially acquired.

RR 5: Our interpretations skills came from discussion with colleagues; we had sessions where we would interpret films like after we had taken them so most of our training was discussion with colleagues with seniors over pathologies...and also having going to regular talks with radiologists...

¹²⁰ Informal learning, implicit and tacit knowledge is discussed in chapter 3 on page 108.

The radiographers who responded to the questionnaire revealed similar formal and informal pathways for acquiring their radiographic skills included the following:

- *During training we were taught to identify basic pathology on most anatomical regions*
- *Have sat with radiologists during reporting sessions*
- *Through years of clinical practice*
- *Discussion with colleagues*
- *Case study meeting*

Informal pathways for acquiring radiographic perception and interpretation skills expressed by the respondent rural radiographers are supported by the literature where it has been revealed that radiographers may acquire radiographic perception and interpretation skills due to the vast number of radiographic images they are exposed to throughout their career (Sonnex et al., 2001; Donovan and Manning, 2006; Coleman and Piper, 2008). While it is acknowledged that radiographers have experientially acquired some radiographic interpretation skills, it appears that they are highly uncomfortable with the responsibility of radiographic interpretation, and it seems that this may be because radiographers are not always confident in their radiographic interpretation.

(ii) Radiographers are not always confident in their radiographic interpretation

The tacit nature of radiographers' perception of a radiographic abnormality appears to sometimes present them with a difficulty in applying a radiographic interpretation to that abnormality. While the radiographers may have an intuitive recognition (Benner, 2001) of a radiographic abnormality, the participants acknowledged that they may not always possess the knowledge to confidently name and so interpret that radiographic abnormality as the following comments demonstrate.

RR 1: Oh, I don't mind bones and obvious chest things but I wouldn't put my life on a chest X-ray because you can miss something, ... I feel fairly confident that there is an abnormality but whether it is congenital or not that's not for me to decide.

RR 4: The more tricky ones are the abnormal chests and the ... guts and so on that you know are abnormal but my knowledge is limited as to why they are abnormal.

This finding of difficulty associated with the interpretation of chest and abdomen radiographic images compared to skeletal radiographic images is supported by the field literature. In the literature it was revealed that, because bones are the most radio-opaque of the internal body structures and possess that familiar anatomical look of the skeleton (Pasveer, 1989), the detection of a fracture is generally a relatively simple binary decision (Donovan and Manning, 2006). In their 2002 study Smith and Younger found that radiographers perform better at interpreting musculoskeletal examinations than chest and abdomen ones. Chest and abdomen radiographs involve images where the anatomy is more complex (Donovan and Manning, 2006; Smith and Younger, 2002) and a wider range of differential diagnoses exists (Smith and Younger, 2002). As a consequence of the complex nature of chest and abdomen radiographic images, interpretation is highly complex and requires a higher level of sophistication. However, as discussed in chapter 1, there are two steps in the reading of a radiographic image¹²¹. The first step, which is perception, is identification of the radiographic abnormality. Once the radiographic abnormality has been identified, then a decision is made as to what that abnormality represents and it this is interpretation which constitutes the diagnosis (Pitman, 2006).

It appears that despite radiographers' perception of a radiographic abnormality, the consequence of a lack of confidence in radiographic interpretation of chest and abdomen radiographic images sees radiographers reticent about offering their radiographic opinion as revealed in the following excerpt.

RR 7: I don't feel comfortable with chests so I rarely say much with a chest.

RR 8: If it's something that you are unsure of you don't offer

¹²¹ The two steps in radiographic image reading, perception and interpretation are described in greater detail in chapter 1 page 49.

A reticence to provide their radiographic opinion in situations in which they are unsure is understandable because radiographers have demonstrated a positive correlation between perceived ability and their actual skill in image interpretation (Coleman and Piper, 2008). While ‘secondary ignorance’ (Dreyfus and Dreyfus, 1996, p. 194) may result in those with a lack of experience misinterpreting radiographic images, it seems that the experiential knowledge acquired by radiographers sees them recognising limitations in their skills in this area.

The participant radiographers acknowledged that there are areas of interpretation where they may be unsure. However, it appears that the tacit nature of the acquisition of their radiographic perception and interpretation skills sees radiographers taking their ability to recognise ‘normal’ versus ‘abnormal’ on a radiographic image for granted as the following excerpts demonstrate.

RR 9: Probably because I look at something and I know

RR 2: His swelling was up to about here, obvious punch fracture, you looked at the films and there was sort of quite a bit of angulations between the fragments ... I think... we are sending the patients away with those films, which brings up another, whole other can of worms but I mean all he has to do is look at that film and even a layman is going to know that that bone is not meant to be at, you know right angles you know ... so in that case, yes, you have done a little bit of damage just go back to your doctor, he can look at the films, you know.

RR 2: ... whereas as I was saying some, blind Freddie can take that film out of that bag and see a fracture...

Radiographers see large numbers of radiographs throughout their careers and consequently develop perception and interpretation skills that often go unrecognised even to themselves (Sonnex et al., 2001). From their first exposure to radiographic images as a novice, radiographers continue to build on their radiographic interpretation knowledge until, as an expert radiographer, they do not rely on analytical principles but rather ‘...with an enormous background of experience...’ and ‘...an intuitive grasp...’ recognise a radiographic abnormality and its radiographic interpretation (Benner, 2001, p. 32). Radiographic perception and interpretation knowledge is acquired over time and, as there are limited acknowledged and formal

pathways for the acquisition of knowledge, radiographers may not be aware of an increase in their tacit knowledge of radiographic interpretation skills (Benner, 1984). This lack of awareness of the increase in their skills may account for radiographers' perceptions of some radiographic abnormalities being so obvious that even the visually impaired *blind Freddie* could not fail to identify them. Although in communication of their radiographic opinion to referrers participant RR8 indicated that: *If it's something that you are unsure of you don't offer*, it seems that this is not always the case. The participant radiographers indicated that there are times when, despite being unable to interpret a radiographic abnormality, they will still offer their opinion as the following excerpt shows.

RR 4: ...if they were going to send the patient home I would say look I really that's abnormal...And leave it at that point that I don't think this is normal I don't know why that's abnormal but that's abnormal.

RR 9: Yeah I imagine I would say what about this bit here I don't think this is probably right and I can't say why but it just doesn't look right.

In these examples it seems that the participant radiographers are concerned that a patient's treatment may be compromised by a lack of identification of a radiographic abnormality by the referring clinicians. The radiographers have commented on the existence of a perceived radiographic abnormality despite their uncertainty, again demonstrating that patient advocacy is integral to radiographic practice (Lam et al., 2004). The central concern for the welfare of the patient is again identified by the radiographers. It seems that despite the difficulties inherent in radiographers' disclosure to referrers, they continue to act as patients' advocates and have adopted a number of strategies specifically to meet and so circumvent some of the difficulties that may present a barrier to communication.

To manage the discomfort radiographers feel at interpreting radiographic images, they reconstruct this task as providing their opinion because they don't see that they have the professional authority to interpret and diagnose.

RR 5: You know what do we think and I suppose I mean we do offer our opinion just because you're the only one there and but I suppose there is this unspoken rule to say that you know this is not the official stance you can just I suppose just share your knowledge if you want to talk about

medical peers and discussion that is largely what it's looked upon as, rather than giving results it is sort of more discussion because obviously you know a little bit more than me about you know X-rays ... just in general but ... we haven't sort of been authorized to give results I haven't been anyway.

RR4: ...I will always preface it with this is the radiographer speaking the radiologist report will be out, ... shortly but in my opinion they have a fracture...

It seems that, while radiographers' perception of their diagnostic responsibility induces them to offer to provide input into radiographic interpretation which they frame as offering their opinion, they appear reluctant to assume responsibility for radiographic interpretation. The ambiguity identified in chapter 2 around radiographers' legal and moral obligations to offer their advice with radiographic interpretation is evident in these excerpts. It appears from these excerpts that the radiographer's obligation to their patient sees them seek to provide radiographic interpretation input but their uncertainty with their legal standing sees them hide behind a perceived legal barrier. It might also be indicative of tacitly acquired cultural knowledge because culture in part determines how members of a group should conduct themselves in certain situations (Haegert, 2003).

Radiographers' lack of formal knowledge and pre-preparation for radiographic interpretation and communication have impacted on radiographers' perceived preparation for rural practice. Indeed 31.7% (n = 19/60) of the questionnaire respondents said their training did not prepare them for rural practice. The free text replies provided by the questionnaire respondents indicated how they believed they were unprepared for rural practice as the following examples illustrate:

- *Training in a rural teaching hospital with travelling radiographic services provided to associated smaller hospitals gave me a rounded understanding of the responsibilities of rural radiography. However in a rural situation I don't think any amount of training is sufficient and much of the needed experience can only be learnt hands on.*
- *To a limited extent e.g. radiograph interpretation. A lot of experience in interpretation is also required however.*

- *In one's training there is always someone more senior to ask for advice, with radiologists easily available if required. Sometimes in rural practice there is no one else to give advice & no radiologists immediately available.*
- *as well as almost NO emphasis on fracture/pathology recognition which would be very useful in after-hours/weekend work where my opinion is sought on almost every patient.*
- *Uni prepared me to perform most radiographic examinations but experience has been the best educator for me in a rural practice.*
- *No training in providing info to referring docs e.g.: What they want to know. What's important clinically. What you are qualified to say. (Learnt all this on the job – the hard way)*

Analysis of the questionnaire data revealed that all the radiographers who trained in a hospital in a rural town believe that their training prepared them for rural practice. A commonality for those radiographers who believed that they were prepared for rural practice was hospital based training, as the following comments indicate:

- *Training in a rural teaching hospital with travelling radiographic services provided to associated smaller hospitals gave me a rounded understanding of the responsibilities of rural radiography*
- *Because predominantly hospital trained this made it easy to adapt to variety of situations.*

The respondent radiographers who received their training at facilities other than hospitals began to indicate that they did not believe that they were prepared for rural practice. Very nearly half the radiographers who were trained at a university in a capital city believed that their training did not prepare them for rural practice. Radiographers' belief that they were not prepared for rural practice has also been expressed by other healthcare practitioners (Blue, 2002; Wakerman and Lenthall, 2002). The ramifications of being insufficiently prepared for rural and remote practice are indicated by O'Regan (1991) who believes working in the bush requires jumping in the deep end and either sinking or swimming. The use of open ended questions in the questionnaire allowed the participants to provide details of how they believed they were unprepared for rural practice using free text replies. The respondent radiographers indicated that where they

were not previously exposed to rural radiographic practice, radiographic interpretation and/or communication with referring clinicians, then they were unprepared for rural practice. This finding was supported by the literature when a radiographer with thirty years' experience, upon moving to work in a remote area, stated that he encountered a 'daunting learning curve' because working in rural and remote areas requires not only knowledge of image acquisition but also interpretation and diagnosis because there was no radiologist (McBrien, 2005, p. 20). Similarly, some of the participants expressed a perception that newly graduated radiographers might encounter difficulties in radiographic interpretation and communication as the following excerpts suggest:

RR 1: They definitely need interpretation...I mean I wouldn't like to put a PDY and even a second year out, they miss things....because they're not experienced enough in reading X-rays....they don't see it, they just... I had a PDY one, with me one day and she was a really good PDY and this kid had come in for his arm X-rayed from the elbow down and, ... he was sent home, no, it might have been his shoulder, and he had pain in his shoulder that's right and they had done his shoulder, nothing there, so he came back three days later and they wanted the whole arm done, so I did the whole arm and I looked at it and just on the corner I could see this funny thing in the chest and so I did chest X-ray and he had a whole bit of his lung collapsed and it was giving him shoulder tip pain and it turned out he had fallen over playing hockey but he had swallowed a piece of chewing gum and it had lodged in his lung, anyway and he went to theatre, but the PDY said I would never have seen that, I wouldn't have even looked at the lung tissue, they only look at...they don't look at the whole thing, it was just a little thing and it just didn't look right ... I mean that probably would have taken a couple of weeks to find, so, just interesting case, wish I had kept it now for a case study.

RR 3: ... that's right ... so it is just little things like that that you try and just ... make them see a bit of practicality and common sense.... it's a learning process so, ... you generally try and make sure that they have had a bit of experience with trauma cases or whatever before we actually put them on call....But ... there's going to be things that they haven't come up against but most PDYs are reasonably level headed and you know, use a bit of common sense....they don't do any call usually for the first six months... So they have had six months with us before they get chucked in at the deep end sort of thing, so they have usually encountered most things and you tell them to ... think through it logically and ... try not to panic.

K: Do you think that they get called upon for information about radiographic interpretation, so reading films?

RR 3: No I don't think so not straight away anyway.... and a lot of them probably don't place themselves in that position they ... dump the film with a doctor or whatever and leave pretty quickly I think....Laughter ...Before anyone gets around to asking them anything.

Radiographers' perceptions of a lack of preparation for rural practice may be understood through Benner's (1996) levels of proficiency because proficiency is experience based (Benner, 2001). Radiographers not previously exposed to rural radiographic practice could be considered novices, and as the radiographers progress through the levels of proficiency in the company of their more experienced colleagues, they develop a mastery of rural radiography and the specific skills it requires (Benner, 2001). The radiographic interpretative skills that radiographers require for effective rural practice were not acquired as a component of their radiography training, and so this is a skill that they were required to acquire through informal pathways. These excerpts also demonstrate that rural radiographers' experiential learning is sustained by a culture of support and collaboration (Benner et al., 1996b). The difficulties with radiographic interpretation that radiographers encounter in rural practice are exacerbated in their attempts to communicate their radiographic opinions to the patient's referrer.

(iii) Referrers may ignore radiographers' radiographic interpretation

The difficulties that radiographers encounter in their attempts to alert a referrer to the presence of a radiographic abnormality through the use of the red dot system were identified in the literature review and supported by the data. Radiographers' difficulties in alerting a referrer to the presence of a radiographic abnormality however extend beyond the limitations and problems of the red dot system into their direct communication with referrers. The participant radiographers indicated that, in some instances, referrers will ignore a radiographer's specific communication of their radiographic opinion as the following excerpt reveals:

RR 2: He just wouldn't have it, that's an old fracture, that's not new, it's an old fracture you don't know what you are talking about, I'm the doctor, so you have no comeback at that because yes, they are the doctor.

RR 6: There are those that set themselves apart and are just completely unwilling to accept any advice from anybody ...

The participants' revelations that they sometimes encounter a referring clinician who ignores a radiographer's indication of a radiographic abnormality is in agreement with the field literature (Brown, 2004). These excerpts seem to reveal more than simply

ignoring the radiographer's comments. The referrer's reported comment of *I'm the doctor* appears to demonstrate that the referrer's decision to ignore the radiographer's comments about the presence of a radiographic abnormality may be attributed to historical professional boundaries. These findings are consistent with the literature where it was revealed that radiographers are working within a medical hierarchy where clinical staff may consider it inappropriate for a radiographer to draw their attention to a radiographic abnormality (Sonnex et al., 2001). The culture of medicine is that doctors assume responsibility for decision making and take charge causing collaborative decision making to be difficult (Hall, 2005).

It was revealed earlier in this thesis that a collaborative team approach is often the mode of practice in rural areas. Teamwork structures such as may exist in collaborative practice can be vertical or horizontal (Wakerman and Lenthall, 2002). In a horizontal structure the team members have similar levels of responsibility and authority, whereas a vertical structure follows a hierarchical line of authority similar to that of metropolitan hospitals (Wakerman and Lenthall, 2002).

Along with the hierarchical posturing of some in the medical profession, it appears that where radiographers are unsure of their standing in the eyes of the referring clinician, they are assuming a vertical team structure as the following excerpt demonstrates.

RR 7: Let the doctor make the decision every time even though they don't know what decision to make.

This excerpt also appears to be indicative of the hierarchical nature of medicine within which the culture of radiography has evolved (Larkin, 1983; Willis et al., 2005; Walton, 2006). Medicine holds a dominant structural position over radiography (Willis, 1989) and, because culture dictates the way in which members should conduct themselves in certain situations (Haegert, 2003), in cases of professional uncertainty the rural radiographers in this study appear to be defaulting to this hierarchical structure. It appears that in situations where communication difficulties exist, radiographers are deferring the decision making to the referring clinician even when the radiographer is aware that the referrer may not be able to make the right decision.

Radiographers however, are not standing by and allowing patient care to be compromised by poor decision making with regard to radiographic interpretation. Rural radiographers' experience and understanding of their responsibilities relating to the interpretation of radiographic images and communication and the ways that rural radiographers have constructed to negotiate communication with referrers within their practice world, is explored under the final theme for this chapter, navigating the diagnostic gap with referrers.

Navigating the diagnostic gap with referrers

Despite the communication difficulties that may arise between radiographers and referrers, the participants have indicated that they persist in drawing upon their experientially acquired radiographic perception and interpretation knowledge for the benefit of the patient. The participants have revealed that they often continue to communicate their radiographic opinion to the referrer by providing their radiographic perception or interpretation regardless of difficulties. The pathway leading to the communication of their radiographic opinion is not always straightforward. Where communication difficulties exist or are perceived, then the participants have indicated that they utilise a number of language strategies that have evolved through social negotiation to compensate for these communication difficulties. The language strategies utilised by the participant radiographers in the communication of a radiographic opinion with referrers are dependent upon their relationship, both personal and professional, with the referrer and also the referrer's recognition of the radiographer's interpretative skills. This thesis has shown that rural radiographers appear to be operating without clear instructions on how to provide their radiographic opinion and that this is compounded by the complexities of professional relationships between referrers and radiographers.

The complexities of professional relationships are evident when the participant radiographers reported that teamwork is often part of working in a rural environment, as these excerpts show.

RR 5: My biggest ... there is a lot of positives I think the biggest thing with working in a rural area which we fortunately do have at this site, is team work because that is how you kind of, you know, you make the

system work and I think the hospital like, between the wards and the A&E and the X-ray department there, there is quite a lot of communication.

RR4: You know where you see a team approach ... you've been part of the team

These findings are in agreement with the field literature where the collaborative nature of rural radiography was raised (Gibson, 2004; Snaith and Hardy, 2008; Smith et al., 2009b). As the excerpt by RR5 reveals, teamwork is more than collaborative practice and positively impacts on communication. As a concept this is also supported in the literature (Norsen et al., 1995; Bourke et al., 2004). These excerpts further demonstrate the social nature of rural radiography (Hammick, 1995; Ahonen, 2008) where there is both interaction and communication (Lewis, 2003). Although the rural environment may positively impact on communications between referrers and rural radiographers, this is not always the case. As a result of the variability in professional relationships, rural radiographers navigating the diagnostic gap with referring clinicians is a complex component of rural radiographic practice. The complex nature of radiographers' communication of their radiographic opinion to referrers as they navigate the diagnostic gap reflects the varying levels of referrers' recognition and acceptance of rural radiographers' skill in radiographic interpretation. The communications that appear to take place between radiographers and referrers range from (i) referrers seeking radiographers' radiographic opinion and (ii) a patient's treatment initiated on rural radiographer radiographic interpretation through radiographers actively (iii) communicating their radiographic opinion to the referrers to (iv) radiographers adopting language games for communicating radiographic opinion to the referrer. The positive impact of teamwork on recognition of the skills and communication between healthcare professionals working in rural areas sees referring clinicians seeking radiographic opinion from rural radiographers and, in some instances initiating interventions to patient care based on the radiographers' radiographic interpretation.

(i) Referrers Seeking Radiographers' Opinions

The collegial professional relationships that may exist between rural radiographers and referring clinicians, together with the conduit for communication that teamwork

potentially provides, sees referrers requesting radiographers' input into radiographic interpretation as the following excerpts demonstrate.

RR 3: I do get ... asked for my opinion quite a few times ...

RR 6: ...in spite of the fact that we have got tele radiology and PACS in the first instance it is always your own view that is canvassed.

RR 9: ...certainly in rural areas when this is what I have and this is what has happened to me in the past ... not only do you feel that you should you are actually asked if you can

This finding is in agreement with the data and the literature. The analysis of the questionnaire data demonstrated that 88.3% ($n = 53/60$) of the respondent radiographers had been asked by a referring clinician for their radiographic opinion. The literature also revealed that in rural and remote areas radiographers work closely with acute care medical staff in radiographic interpretation (Smith et al., 2009b). Clearly, the data reveals more than anecdotal evidence of radiographers being requested by referring clinicians for input into radiographic interpretation and fits with Smith's (2008, p. 318) revelation that he is '...frequently asked by doctors for my opinion about radiographs'. The results from the questionnaire provide some insight as to what constitutes RR 3's '...quite a few times...' where 8.3% ($n = 5/60$) of the questionnaire respondents revealed that they were called upon monthly for input into radiographic opinion, 25% ($n = 15/60$) said that they were called upon weekly, 35% ($n = 21/60$) said that they were called upon daily and 20% ($n = 12/60$) said that they were called upon several times a day for input into radiographic opinion. Referrers seeking radiographers' opinion appears to be a common event for some rural radiographers.

Although radiographers may be called upon up to several times a day for input into radiographic opinion, the following excerpt demonstrates that not all referrers universally request opinion from all radiographers but rather it is dependent upon the radiographer/referrer relationship.

RR 3: It depends a bit on the ... referrer and their rapport with the radiographer, some will ask our opinions, others ... just sort of ... or they look for other ... doctors around the hospital to discuss it with.

RR 5: We do, we are able to communicate I mean you have your conflicts naturally but overall you know there is quite a bit of team work

The preceding examples demonstrate the difficulties that can arise when a skill such as radiographers' ability to accurately perceive a radiographic abnormality and subsequently interpret that abnormality on radiographic images is both unrecognised and unspoken (Egan, 1993). Where a relationship exists between referrer and radiographer such as may happen in small towns, because it is not just patients that radiographers may know but also their fellow healthcare workers, then referrers may be aware of the skill of the radiographer and so seek their input¹²². From this excerpt it seems that, if a referrer is unaware of the skill a radiographer possesses at radiographic interpretation, they may not consider asking for their input. An implication for patient care that arises as a result of a referrer seeking input from fellow doctors as suggested in the preceding excerpt is that the questionable level of skill that some referrers have in radiographic interpretation may be compounded rather than alleviated if they confer with a similarly inexperienced doctor¹²³. Evidence of the value that referrers may place in radiographers' radiographic interpretation skills was also revealed by the radiographers. The radiographers indicated that some referring clinicians look to radiographers for assistance with image interpretation not as a verbal request to disclose, but as a written request that involves the radiographer sending a patient onto appropriate treatment based upon their radiographic interpretation.

RR 2: If something is really obvious you know there is a fracture there the doctor has written on the form query fracture send to cas¹²⁴,

RR 5: ... often the GPs will write on their forms you know please send patient to A&E or they will tell the patient to tell us that they need to go to A&E if there's a fracture so that kind of puts us in a position... have to give the patients the results on site so that they can follow the GP's original instruction.

In these examples the forms that participants refer to are the request forms, and in these instances the referring clinician has requested on the form that, along with the radiographic examination required, upon identification of a fracture on the patient's radiographic images, the patient is to be sent to the casualty department of the hospital

¹²² The nature of interwoven relationships that may exist in rural towns is discussed in chapter 1

¹²³ Varying skill level of different medical professionals is discussed in chapter 2

¹²⁴ Cas is an abbreviation for casualty department

to seek the appropriate treatment for that fracture. This finding is also reported by Smith (1995) who found that there is evidence that a radiographer in a country hospital may be called upon up to several times a day to assist local doctors with interpreting radiographs and that this may alter the patient's treatment. In the preceding examples, upon the radiographer sending the patient with an identified fracture to casualty, the doctor in casualty would review the radiographs and decide upon the appropriate course of action. In some cases, however, upon identification of a radiographic abnormality, it is the radiographer who is proactive in seeking the appropriate treatment in order to ensure optimum patient care. Consequently the treatment that a patient receives appears to be a direct result of the radiographer's communication of their radiographic interpretation to the referrer.

(ii) Patient's treatment initiated on rural radiographer radiographic interpretation

Radiographers' proactive involvement in not only communicating their radiographic opinion but also in pursuing the appropriate medical intervention, reveals complex and sophisticated decision making by the participant rural radiographers. In the following excerpt it is evident that, on the basis of the participant's radiographic interpretation and triaging of the patient, some referring clinicians who hold a radiographer's radiographic opinion in high esteem may initiate treatment to the patient based solely on the radiographer's opinion.

RR 1: Oh I was at (RRMA 5 hospital) once and this guy came in the ambulance and I had a phone referral to do a chest X-ray because he had breathing difficulties so I did it. He had a tension pneumothorax so I rang his doctor and I said like this man's got a tension pneumothorax what do you want to do and he said well I am 45 minutes away and I said oh, I think you need something done, so he rang the opposition doctor and he came up and he put a tube in and it went ssst and it went all over the walls and everything it was really a tension one so I mean that was another indication where a radiographer needs to be able to read a chest X-ray.

In this instance it appears that the referrer's confidence in the radiographer's interpretation skills was sufficient to warrant immediate instigation of medical intervention. This finding is consistent with the literature where it has been reported

that, when confidence in a provided diagnosis is high, then patient management may be instigated on the presumption that the diagnosis is accurate (Ng and Palmer, 2007). There are numerous anecdotes where an immediate result of a chest radiographic image has produced a significant benefit to the patient (Sonnex et al., 2001). This is demonstrated in the preceding extract as the pathophysiological consequences of a tension pneumothorax may rapidly result in a life threatening situation (Brashers and Davey, 1999). The referrer's confidence in the radiographer's radiographic opinion, in tandem with the radiographer's intervention, resulted in the evasion of a potential life threatening situation for the patient. This participant's statement, however, reveals more than could be found in the literature because, in this instance, the referrer set into play a pathway for the patient's treatment based entirely on the radiographer's radiographic interpretation. In this case the referring clinician did not see the radiographic images prior to calling a professional colleague from a different medical practice to treat his patient. In this situation the *rapprochement* that RR 3 referred to that may exist between referrer and radiographer was such that, not only was the radiographer's opinion valued, but lead to the instigation of a treatment pathway for the patient.

The concept of positive professional relationships is supported in the literature where it was identified that in rural and regional Australia innovative healthcare models have evolved in order to meet local healthcare needs (Humphreys et al., 2008). These healthcare models have resulted in multidisciplinary practice and practitioners working in extended roles (Wakeman and Lenthall, 2002). These models are a result of necessity, sometimes urgency, and the often limited range of healthcare professionals available in rural and remote areas and so '...professional boundaries tend to be less rigid and scopes of practice broader' (Productivity Commission 2005, p.208). Although rurality may create an environment where the radiographer's opinion is not only sought but highly valued, this is not always the case as was revealed earlier in this chapter.

The outcome of this maze of interactions is that radiographers are faced with the complex dilemma of choosing how to appropriately communicate information to the referrer in order to satisfy their perception of their diagnostic responsibility. Although the AIR guidelines instruct radiographers to '*...alert medically significant findings to the medical personnel responsible for the patient's treatment*' (Australian Institute of Radiography, 2007, p. 3), these guidelines do not provide advice on the processes

radiographers should follow to alert referrers to medically significant findings. In the following section the findings demonstrate the different communication strategies the participant radiographers are using to ensure that a referrer becomes aware of a radiographic abnormality even when the referrer does not actively seek the radiographer's radiographic opinion.

(iii) Communicating radiographic opinion to the referring clinician

In this chapter it has already been demonstrated that the collaborative nature of teamwork which may exist in rural healthcare positively impacts on communication, and how it appears that it is these open communication channels that see referrers requesting radiographers' input into radiographic interpretation.

RR 2: I am quite happy to ring them and say look your patient has got a pleural effusion...I am quite happy to do that or a fracture...

It is these very same open channels of communication that allow radiographers to communicate their radiographic opinion to referrers without difficulty or complication as the following excerpts demonstrate.

RR 4: ...I've actually gone around when I've been working at the hospital with a private patient and spoken to the DEM¹²⁵ person the doctor in DEM and said look this is such and such don't you think...

RR 5: Rather than offering a diagnosis so I think it is largely to do with discussion and because a lot of the well a lot of the A&E doctors that come through are locums and a lot of them ... don't necessarily have the experience...

In these examples the radiographers have not utilised the red dot system or indeed any type of RADS. The radiographer, informed by their radiographic interpretation, has simply talked with the referring clinician and through discussion they have constructed a radiographic opinion. This finding is supported in the literature by Hall, Kleeman & Egan (1999, p.11) with their assertion that MITs (Medical Imaging Technologists) working in 'remote locations have informally offered opinions for many years'. In these excerpts the radiographers and referrers are dynamically constructing a

¹²⁵ DEM is Department of Emergency Medicine

radiographic interpretation as they work collaboratively to assist the referrer in arriving at a diagnosis. Effective communication however, is commonly dependent not only upon the personality of the individual, but also each individual situation (Leonard et al., 2004), and in situations where open discussion with a referrer is not possible, radiographers appear to be using language games to ensure that a radiographic abnormality is identified.

(iv) Language games for communicating radiographic opinion to the referrer

The participants revealed that where straightforward, uncomplicated communication as demonstrated above is not considered an option, radiographers are adopting enigmatic language strategies to ensure a referrer is made aware of a radiographic abnormality as the following comment demonstrates:

RR 8: Maybe even and I often teach not that you can teach people personality but you even sort of give them give the young referrer or the referrer an opportunity by heading them in a direction and quietly saying now don't you think that looks a bit extraordinary or something like that there are ways to handle it. And by humility as I said not a suck hole ... but you don't jump down their throat and say you don't know what you are looking at I do

In this excerpt, the participant radiographer has adopted nonspecific language to ensure that the referrer is aware of a radiographic abnormality in order to avoid confrontation with the referrer that in their eyes might arise by using straightforward disclosure. The language used by the radiographer also seems to avoid some of the factors that inhibit radiographers' attempts to close the diagnostic gap such as radiographers' are not always confident in their radiographic interpretation and referrers may ignore radiographers' radiographic interpretations.

Another application for language games that participants appear to employ with communication is to assess the referrer's radiographic interpretation skills and then for the radiographers to intercede if the radiographer suspects that the radiographic abnormality may be overlooked as the following excerpt demonstrates.

RR 4: So you would take your films around and you would go, I think you'd better look at this and then you would stand back and let them look

at it. And then if they went round and round and round whatever what was obviously wrong, you would say, I would either say if it was obvious fracture or something I would be quite happy to offer an opinion and say what do you think of that and then lead them in to it that way.

RR 7: Yep I wouldn't say it is I would say that doesn't look right to me or what do you think about that does that bulge look normal... I would let them make the decision I would give them a hint there's something wrong

RR 9: I would just say what do you think about this area here... I am not sure that this is normal...and then perhaps suggest what I think it may be

It appears from the participants' comments that the centrality of the patient to rural radiographic practice drives rural radiographers to ensure that a radiographic abnormality is identified and acted upon appropriately, and that radiographers will continue to guide a referrer until this is achieved. This may be considered an example of collaborative practice as there is an '...interdisciplinary team whose individual members have unique skills and expertise that are applied to accomplish the mission' (Norsen et al., 1995, p. 44) where in this case the mission is identification of the radiographic abnormality. It appears that radiographers' ability to guide a referrer may be limited by their own limitations in radiographic interpretation. But it is also radiographers' cultural background that influences the actions that a radiographer might consider possible within a given situation (Forsythe, 1993). By adopting the communication strategies outlined above, radiographers are attempting to avoid many of the impediments to communication that could result in a referrer's failure to identify and act upon a radiographic abnormality. The language employed by the participant in this excerpt appears to be an example of '...the common practice of speaking indirectly (the "hint and hope" model)...' (Leonard et al., 2004, p. 86). Such language strategies are fraught with risk because there is the risk that the referrer may fail to identify the radiographic abnormality (Leonard et al., 2004). A communication practice that will allow open communication and avoids the tendency for individuals to speak indirectly and deferentially, is essential for safe care (Leonard et al., 2004). Straightforward communication by radiographers could be considered such a communication practice. Where straightforward communication with the referrer is not an option, one radiographer offered another example of indirect communication as a specific example of providing covert opinion to the referrer that involved using the patient as the conduit.

RR 1: I say well you have to check with the doctor, but that also puts doubt in the patient's mind and they'll say but the radiographer said they thought I might have had a crack and then they will wander in, the patient said you thought there was a crack here, and yeah, here it is

In this example it appears that, where geographical separation or professional distance preclude straightforward communication with the referring clinician, the radiographer may inform the patient of their radiographic opinion in order to ensure the referrer becomes aware of the radiographic abnormality. In cases where the radiographic abnormality is subtle and the radiographer is concerned that the referring clinician will miss it, they mention the abnormality to the patient so that they can make the referring clinician aware of the abnormality. Again it appears the radiographer is using indirect language, hinting and hoping, and again there exists a risk of a failure for the radiographic abnormality to be identified by the referrer as a result of the potential for perceptual error or if the patient fails to pass on the radiographer's radiographic opinion to the referrer.

Summary

Rural radiography is patient focussed. The diagnostic gap, therefore, potentially presents a dilemma for rural radiographers because it may result in a risk to patient care. It is this risk to patient care that provides the impetus for rural radiographers to move beyond the technical acquisition of radiographic images into communication of their radiographic interpretation. Whatever level of collaboration exists between rural radiographers and referrers, as they navigate their way through the diagnostic gap, rural radiographers and referring clinicians bring themselves to this discussion. The practice world of the rural radiographer is shaped by the social and cultural background that includes explicit formally acquired knowledge and informally acquired implicit and tacit knowledge. It is rural radiographers' construction of rural radiographic practice that influences radiographers' actions and interactions as they navigate the diagnostic gap. Rural radiographers' social, cultural and historical background is important as it provides the basis of the knowledge that they draw upon for radiographic perception, radiographic interpretation and subsequent communication of their radiographic opinion and the strategies that they employ in their communication with referrers.

Chapter 5 has revealed the first five of the themes identified from the analysis of the data. Each of these five themes has been presented and described in turn along with its supporting themes. Relevant sample quotations drawn from the rural radiographer narratives have also been presented with explanation and interpretation in order to provide the radiographer's voice. In the preceding excerpt where the radiographer has used the patient as a conduit for conveying the radiographer's radiographic interpretation to the referrer, the radiographer informed the patient of the existence of a radiographic abnormality on their radiographic image, in this case a fracture, using the word *crack* rather than the word fracture. The discussion that may take place between radiographers and patients regarding radiographic abnormality is more extensive and complicated than this comment enucleates. Just as radiographers employing their informally acquired skill in radiographic interpretation to fulfil their perception of diagnostic responsibility sees rural radiographers adopting strategies in order to communicate with and so navigate the diagnostic gap with referrers, it is this same skill and patient focus that drives radiographers to adopt strategies in order to disclose their radiographic opinion to their patients. The following chapter presents the last of the identified themes, disclosure of radiographic opinion to patients.

Chapter 6: Rural Radiographers and Disclosure of their Radiographic Opinion to Patients

Introduction

The previous chapter presented the preconditions that lead to rural radiographers' involvement in radiographic interpretation and communication of their radiographic opinion to referrers. In addition to these interactions radiographers also find patients are requesting diagnostic information following their radiographic examination (Dimond, 2002) and want to be told the results at the time of the examination (Vallely and Mills, 1990; Schreiber et al., 1995). These requests are a source of tension for radiographers because as the earlier chapters show interpretation and reporting of radiographic findings are the responsibility of radiologists. Radiologists provide reports to referrers and there is usually no contact between the radiologist and the patient in plain film radiography (Schreiber and Winslade, 1987; Campeau, 1999; Kenny and Pacey, 2005; Doss, 2007). This means the diagnostic gap, described in the previous chapter, which may represent a significant delay between the time patients have their radiographic examination and the time when referrers receive the radiologists report also represents a delay in time between patients having their radiographic examination to when they are informed of the results.

Even if a patient is aware that it is the radiologist's role to report on radiographic findings (Goldin, 1979), there is no avenue for them to interact directly with a radiologist. Knowing that they are facing a time delay before receiving the results of their radiographic examination causes patients' anxiety (Berlin, 2007; Gilbert et al., 2011), which may be why patients question the radiographers about information as to what is demonstrated in their radiographic images. The ways that radiographers respond to such requests appears to be largely neglected in the radiological literature.

Chapter 5 showed how radiographers are uncomfortable with acknowledging their interpretative role and prefer to speak of this in terms of offering their 'opinion' to referrers in order to protect themselves legally. This is not an effective strategy in the immediacy of a patient wanting to know the results of their radiographic examination therefore the radiographer is confronted not only with legal dilemmas but also ethical

and pragmatic interpretation and disclosure problems. The findings presented in this chapter show how radiographers understand their interpretation and disclosure responsibilities to patients. The findings show radiographers use an approach to modify their disclosure to patients and filter the truth. The information that radiographers disclose to patients is not based upon their formally acquired and acknowledged image acquisition skills, but rather their informally acquired knowledge of radiographic interpretation and disclosure.

Disclosure of radiographic opinion to patients

The rural radiographers' responses to both the questionnaire and the interview questions provided insight into their involvement in disclosure and the decisions that they make around how they frame their replies to patients. Rural radiographers' disclosure to patients cannot be understood without first establishing both the extent to which disclosure occurs and also why rural radiographers choose to respond to patients' requests for diagnostic information. This complex humanistic dimension of rural radiographic practice is explored in this first section, understanding radiographer disclosure to patients.

Radiographers' understanding about responsibility to disclosure information

The rural radiographers who participated in the interviews suggested that patients requested diagnostic information at the completion of their radiographic examination as the following excerpts demonstrate:

RR 5: Out of hours I actually find the patients ... they do ask and they want to know straight away what they have got especially fractures.

RR 2: The patients are constantly asking ... I would say 90% of your patients would say to you at the end, so what's on it?

This finding is consistent with the questionnaire findings that showed that 60% (n = 36/60) of the radiographers encounter requests from patients for their radiographic opinion which is also supported by the field literature (Schreiber et al., 1995; Dimond, 2002). Nevertheless there appears to be a paucity of evidence relating to the ways

radiographers respond to such requests. One study reported that lengthy delays for diagnostic information provoke anxiety for the patient (Gilbert et al., 2011) which was a view point shared by the radiographers who participated in this study.

In their accounts of patient care, many radiographers spoke of being aware of patient's anxiety arising from their desire to know more about their possible diagnosis as is shown by this excerpt provided by a questionnaire respondent.

Can often relieve anxious pt allowing for delays in final diagnosis.

It is only after diagnosis that a patient can make plans for the future and any necessary domestic adjustments to accommodate their illness or injury (Summerton, 2011). Patients, therefore, experience stress as a result of diagnostic uncertainty (Vallely and Mills, 1990) and this stress may be alleviated by an immediate reassurance of a negative finding or explanation (Vallely and Mills, 1990). Furthermore research suggests that some patients will not be content with being informed that their referring clinician will receive the results from the radiologist (Schreiber and Winslade, 1987). There are clearly benefits for the patient in receiving timely results of their radiographic examination although disclosure presents a number of difficulties for the radiographer. This is of concern because the findings from this study suggest the incidence of patients requesting diagnostic information may be considerable, and as well the anxiety that patients experience their requests for information are in turn a source of tension for radiographers.

Requests from patients to know about their condition immediately, creates significant pressure for radiographers as the following excerpts reveal:

RR 2: ... I think they want you to tell them, I think...they feel that you should tell them straight away what's wrong with them

RR 5: Then they come to us, who they know is going to have the result and they put a lot of pressure on you to sort of tell them what's happening because I suppose they're sitting there thinking well if they have a break you know do they have to organize their kids or do they have to ring their bosses. I think it is more the practical reasons and the knowing; there is a huge impact on somebody who has a fracture versus someone who doesn't for what happens to them after that apart from just in the hospital.

Patients' requests for information about their radiographic examination presents a further source of tension for radiographers because they see this as the professional domain of the referrer as the following excerpts reveal.

RR 5: But as a rule, the system is that you are meant to go back to your we are not meant to tell you anything you're meant to go back to your GP and he is supposed to give you the results but it's not practical because what happens is they go back to their GP they get the results then they have to come back to A&E to get treated.

RR 8: Oh simply because I think it is the doctors and I still believe that it is the doctor's job to inform the patient of, of their ... situation... I certainly don't tell the patient in serious medical conditions if it is simple fractures and maybe even a fractured rib...I would inform the patient. But you do draw the line in the sand ...

The conundrum for rural radiographers is that while they believe that disclosure should fall to the referring clinician, they are also under immediate pressure to disclose to the patient. Furthermore, the excerpt by RR5 demonstrates that the pragmatics of working within the rural radiographic environment mean that adhering to such an ideal would impact upon patient care. Again the diagnostic gap is seen to impact upon patient care. Withholding diagnostic information from the patient would mean that the patient would be unable to seek appropriate timely medical intervention. Therefore despite the tension that exists for radiographers due to their involvement with disclosure to patients, the participants are providing diagnostic information to their patients. This can be seen as the adoption of an informal procedure in response to a given situation where difficulties may arise with the blanket application of formal procedures such as deferring disclosure to the referrer because of the potential impact on patient care (Symon et al., 1996). Radiographers are therefore forced to develop strategies to facilitate some level of disclosure.

In this study radiographers approached their disclosure to patients by carefully framing their replies to patients around honesty as revealed in the following extract.

RR 6: ...I am going to tell you because well a – you have asked me and I am not going to lie to you...

The questionnaire results show 70% ($n = 42/60$) of the respondent radiographers indicated that they have provided a patient with their radiographic opinion but only 55% ($n = 33/60$) of the respondents believe they should disclose their radiographic opinion. As such it seems radiographers' disclosure to their patients is far more complex than the provision of frank and open disclosure of their radiographic opinion as the excerpt above implies. There are various factors that impact upon, and so influence the degree of disclosure, as the following excerpts demonstrate.

RR 2: Just that one or ... just like stretch the truth a little bit you know so that they... so that you are not telling them too much but they can get a result or you know.

RR 3: No as I say I usually like to be honest with them.

What this suggests is that just because a patient may request diagnostic input from a radiographer this does not mean that the patient will automatically receive full disclosure. It appears that there are instances where a radiographer may move away from absolute honesty with a patient, as *usually like to be honest* and *stretch the truth* are clearly not always honest and completely truthful. The questionnaire provided some insight into why the participant radiographers have indicated that in some instances they may be reticent with regard to disclosure to patients. The questionnaire revealed that 83.3% ($n = 35/42$) of those who provided some diagnostic information to patients said that their disclosure was dependent upon the diagnosis.

It seems that the less serious the radiographer perceives the diagnosis the more likely the radiographer will disclose information to the patient. As one radiographer stated in the questionnaire:

only fractures or other pathologies where treatment is straightforward emotional/legal quagmires may be stumbled into

This may be explained because the perceived risk to the patient may be less for a fracture than for pathology, also fractures are considered easier to identify in radiographic images than pathology making the margin for error less. These appear to be important considerations for the radiographer because *emotional/legal quagmires may be stumbled into*. The radiographers associated these emotional and legal difficulties as being more apparent in situations where the radiographic images indicated more complex pathologies. The more acute and serious the identified

radiographic abnormality, the more unlikely a radiographer will take responsibility to disclose information as the following excerpt shows.

RR 4: ...there's obviously a need for further discussion ...I think it is more the medico-legal thing comes more from that further discussion because if they have results there is obviously a psychological effect if you have cancer or if you've got cancer I can't send you home... without you having had counseling so although I mean the onus is now being put on the referrers to when they are sitting there in their office to obviously assess their patient and knowing what their circumstances and conditions are to make sure that they are emotionally prepared for the news so that when they do get the news that they have questions that can be answered and you know that sort of thing so I think it is more to do with that.

In these situations radiographers seemed to be more mindful of the patient's need for careful and detailed disclosure. Without this level of disclosure the radiographers were more aware of the high degree of harm to which the patient would be potentially exposed, and therefore the legal and ethical considerations related to disclosure became more prominent. As such most radiographers in this study preferred to not disclose their radiographic opinion in cases where pathology was identified because *your GP...he is supposed to give you the results.*

When faced with a patient who has a radiographic abnormality that is considered to indicate serious pathology or injury, who is seeking diagnostic information, the participants were very clear about disclosure not being their responsibility as is demonstrated by the following excerpts from the questionnaire respondents.

- *Without formal training not appropriate*
- *As we are not formally trained to do so and as such are left open to litigation.*
- *in general it's the Doctor's place to discuss diagnosis. We don't know the patient well enough or their reaction to news, or what other tests have been done.*

Despite arguing it is the responsibility of the referrer to disclose information to patients, simply refusing to answer patients' questions was not an option for the radiographers. Rural radiographers are not basing their disclosure on a simple binary decision of whether or not there is a radiographic abnormality, but rather there appear to be

mitigating factors that affect how radiographers word their replies to patients. The lack of a formal framework for disclosure means that it is possible for radiographers to modify their replies to patients because the radiographer-patient interface presents radiographers with areas of ‘discretionary freedom’ (Hall and Davis, 1999, p. 165). The mitigating factors that lead rural radiographers to modify their replies to patients and so exercise discretionary freedom are described in the next section.

Factors that modify radiographers’ level of disclosure to patients

It appears that without formal procedures and protocols for rural radiographers to follow in order to decide how to reply to a patient’s request for diagnostic information, rural radiographers are using four factors to guide the framing of their replies to their patients. The factors that guide radiographers’ disclosure of their radiographic opinion to patients are (i) the radiographer’s assessment of the patient which includes reading the patient and whether they know the patient, (ii) legal considerations, (iii) the perceived significance of the pathology identified on the radiographic image and (iv) wanting to avoid causing the patient to worry. Each of these factors is explored in turn in the following section.

(i) Radiographer’s assessment of the patient

In the execution of their radiographic acquisition duties the participants have indicated that they are making more than a clinical assessment of their patient. The participant radiographers’ assessment of the patient includes their personal relationship with the patient and the radiographer’s judgement of how well they believe a patient will cope with the information to be disclosed. The participants indicated that they read patients in order to assess the level of disclosure that they believe is appropriate for that individual patient as the following comment demonstrates:

RR 5: (laughs), although, although that’s what happens. But ... once again because I don’t see them as, as I see every patient as being individual because I can tell that somebody is going to handle it fine there is some patients that laugh about it you know they have this attitude oh it’s just you know well they’ll fix it and there’s others that just go down in heaps.

From the outset it appears that radiographers are not only clinically assessing their patients prior to commencement of the radiographic examination to assess the radiographic imaging protocols appropriate for that patient, but they are also assessing the patient for signs to indicate their ability to receive diagnostic information from the radiographer. In other words as the radiographic examination is taking place, radiographers are identifying cues exhibited by the patient in order to assess not only the patient's psycho-social needs (Bowman, 1993) but also the vulnerability of their patients with regards to full and open disclosure (Fallowfield et al., 2002). Radiographers' assessment of the vulnerability of their patients reveals the ethical nature of disclosure because protecting the interests of patients with regard to information disclosure is an ethical responsibility (Pang, 1999; Sullivan et al., 2001; Hodkinson, 2008). A rural radiographer's assessment of the patient commences from the moment that they meet that patient as the following excerpts demonstrate:

RR 2: The more experienced you get you can tell when they stand from that waiting room how they are going to react and what sort of person they are.

RR 4: I gauge that. You can normally gauge that within 30 seconds of seeing somebody and as I say I don't always get it right but I will get it right 95% of the time... recognize the signs in the way, the expressions of people or their attitudes or whatever and I think, I think you're lucky if you have that skill...it's obviously my interpretation of my own skill at it... I think it actually tempers everything I do it's whether you are speaking ... with children whether you are speaking with adults ... whether you are speaking with carers ... it's part of what you do...if I'm...concerned that the patient is going to only hear what they want to hear out of what I am about to say i.e. that they're obviously super uptight... And ... if I mentioned any word that could be misconstrued and then they are likely to click onto that word and not listen to anything else...Then I will be extra careful about using anything other than ... a very generalized descriptor.

RR 5: So you assess and this based purely on first impression.... because over the years you will learn that you can...easily pick up whether someone is anxious, worried ... you know aggressive or whether they are just completely apathetic...And you find, you can just I think it just comes with experience

The participants have not specifically identified how they assess a patient but rather suggested that their ability to assess the patient comes from experience, alluding

to the tacit nature of this assessment. This finding is consistent with the field literature where it is recognised that the assessment of competence of a patient to receive information by a healthcare professional may be both automatic, implicit (Gordon, 1988a) and based on intuition (Fulbrook, 1994; Hodkinson, 2008). Rural radiographers' assessment of the patient from *when they stand from that waiting room* reveals intuitive recognition of the vulnerability of a patient. The decision making around what is an appropriate response to each individual patient's questions is not the result of guessing but rather is based on experience (Gordon, 1988a). An immediate intuitive response to a situation that also takes into account the context of that situation demonstrates expert skilful ethical behaviour (Dreyfus et al., 1996). The literature examining patients' perceptions of the appropriateness of the diagnostic information that they receive from healthcare professionals reveals that patients have expressed appreciation at a clinician '...judging how much information they could handle...' (Thorne et al., 2010, p. 751). Rural radiographers assessing their patient may be based in part on intuition, but it also appears that working in a rural environment may also afford radiographers some assistance in assessing their patient.

The familiarity and interwoven relationships that often exist within rural communities means that radiographers may know their patient prior to their presentation for a radiographic examination as the following comments illustrate:

RR 3: As I say I have lived around this area for ... all my life so I am encountering people all the time that I sort of know, in one way or another ... you know not always relatives but people I played sport with and went to school with and ... friends with them...

RR 6: ... no worries I mean ... if I only X-rayed people that I didn't know that wouldn't be very many.

The pervasive nature of rural relationships is supported by the literature where it is has been established that it would be very difficult for a healthcare professional not to become a friend or at least social acquaintance to many of the residents of a small town (Fuller et al., 2002). The rural environment, however, is not the exclusive domain of close and familial relationships because healthcare professionals who work in metropolitan areas may also know their patients (Cook et al., 2000). One difference between rural and metropolitan radiography is in the number of patients that may be

known to the rural healthcare professional. The consequence of living and working in rural areas where there are fewer healthcare professionals and smaller populations (Blue, 2002) compared to metropolitan areas, is that the likelihood of a rural healthcare practitioner encountering a family member or a friend as a patient is greatly increased.

The questionnaire also provided agreement on the potential for interwoven relationships for rural radiographers with 90% (n = 54/60) of the radiographers indicating that they were living in the same community where they were working. As outlined in chapter 1, living and working in a small town is likely to result in a healthcare professional becoming a friend or at least social acquaintance to many of the other residents of that town. Caring for family and friends may prove unavoidable in rural healthcare practice. The findings in the questionnaire also supported this concept as only two of the radiographers responded they are never required to image friends or family members. Frequency analysis of the questionnaire data revealed the extent to which radiographers may encounter family and friends as patients with 28.3% (n = 17/60) indicating that they rarely had to image friends or family members, 53.3% (n = 32/60) occasionally had to image friends or family members and 13.6% (n = 8/60) often had to image friends or family members. The respondent radiographers provided a range of comments for the issues that X-raying people they know raise for them including the following:

- *Lots of friends wanting my diagnosis on their films without waiting to get radiologist's report.*
- *It is part of the position of a rural/remote radiographer and does not worry me at all.*
- *Emotionally difficult if possibly serious problem*

Knowing the patient is a double edged sword. While a pre-existing relationship for the radiographer allows them some insight into the patient, it appears that the patients in turn use their relationship to support questioning the radiographer for diagnostic input. This in turn seems to place some radiographers in an emotionally difficult situation when their radiographic interpretation reveals a significant health problem for the patient, as caring for a family member or close friend as a healthcare

professional is highly stressful (Dwyer, 1996). While the complexities of these relationships may present rural radiographers with some difficulties, it also seems that an ancillary aspect to knowing their patients is that the radiographers believe it affords them some leeway in disclosure. In the following excerpt the impact that knowing the patient has on the radiographer's assessment of the level of disclosure that is appropriate for that patient is demonstrated.

RR 8: ... I think it is obvious...Again if it is something that I am not sure of but I tend to be a lot looser if I know if they are friends of mine...Oh because I know they won't take me to court and say you know you don't know what you are talking about.

The participants believe that where there is a pre-existing relationship between the radiographer and the patient, this provides radiographers with the opportunity to increase the level of disclosure. Disclosure to patients however, is apparently also limited by one of the same factors that impact on their communication with referrers¹²⁶, in that radiographers are not always confident in their radiographic interpretation. This is balanced against an assessment of the patient that is based in part on the pre-existing relationship. It seems that radiographers will reveal more to someone they know, because they believe that friendship will afford them some protection from the repercussions of the perceived legislative limitations that surround disclosure to patients. The concept that pre-existing relationships are a foundation for mutual trust is supported by the literature where it has been noted that, because rural healthcare professionals are less able to separate their professional and personal lives, 'trust is woven from threads of shared community life, not just healthcare encounters...' (Glover, 2001, p. 333). It seems that radiographers believe that friendship may afford some protection from a law suit, however as already revealed, radiographers do not know all of their patients. The result is that this perceived protective barrier arising from mutual trust does not exist for all rural radiographic examinations, and so disclosure to patients may be limited due to concerns around the legal implications of that disclosure.

¹²⁶ Described in chapter 5, page 200.

(ii) Legal Considerations

Rural radiographers appear to be uncomfortable about their legal position with regard to disclosure to patients and this is reflected in the following comments:

RR 2: You know. Whereas the radiologists they've got their medico legal insurance and if they say something wrong then they've got that to fall back on ... whereas if we tell somebody something and we are not meant to tell them in the first place and it's wrong then we could get in hot water.

RR 9: Well if they have got something dreadful well they may well who knows what they will do. I think if you tell them there is nothing wrong in actual fact there probably may be I think that's when you are really going to get into strife because that's when they will go and talk to other people about it and ... you could even end up with a law suit maybe I don't know.

These excerpts mirror the ambiguity that was identified in literature reviewed in chapter 2 where it was demonstrated that the legal standing of radiographers with regard to disclosure of diagnostic information to patients was unclear. It is evident from the field literature that there is significant ambiguity around the legal standing of radiographers' disclosure to patients with the result that rural radiographers are operating under the perception that there are legal impediments to their disclosure to patients¹²⁷. Consequently radiographers are unsure of what information they should disclose to patients (Lewis, 2002). This ambiguity was also identified in the questionnaire data where radiographers' opinions of where they stand medico-legally when disclosure of opinion to patients was requested. The questionnaire data identified that 50% (n = 30/60) of radiographers believe that they will be held medico-legally responsible for disclosing their radiographic opinion; 25% (n = 15/60) said 'no', and 23.3% (n = 14/60) responded 'don't know'. There is apparently no consensus with rural radiographers as to where they stand legally with regard to disclosure to patients. Legal concerns however are not the only factor that sees radiographers limiting their replies to patients. A radiographer's disclosure is also dependent upon the diagnosis indicated by the radiographic abnormality and the perceived consequences of this diagnosis to the patient.

¹²⁷ Discussed in chapter 2, page 97.

(iii) **The perceived significance of the pathology identified on the radiographic image**

Prior to disclosure of their radiographic opinion, radiographers are deciding the significance of an identified radiographic abnormality in relation to the potential impact and outcome for their patient. The participant radiographers' perception of the significance of the identified radiographic abnormality also contributes to the decisions that they make around limiting their replies to patients: the more significant they perceive the abnormality to be, the less they disclose as the following excerpt demonstrates:

RR 1: Well most people know they've got a fracture, they're pretty sure. It's mostly only with fractures really ... they know that it's fractured or not or they're pretty sure it is and so I don't mind telling them. I don't tell everyone. If it's an obvious fracture they know anyway... Oh I wouldn't say anything, definitely not, no, I would just say I don't read X-rays, you will have to talk to your doctor, ... I definitely wouldn't say anything about Ca¹²⁸ ...that's a whole different ball game, like you've got the emotional side, the patient's emotional side, I mean the doctor's going to have to do that, definitely wouldn't say that no.

RR1 has suggested that *most people know they've got a fracture, they're pretty sure*. The idea that a patient would be aware of a fracture is supported by the literature, where, although the clinical manifestations of a fracture depend upon the site and type of fracture, following trauma a patient would exhibit some of the general signs or symptoms consistent with a fracture such as impaired function, deformity, swelling, tenderness and pain at the site of injury (Mourad, 1998). The radiographers did not specify why the discrepancy exists between disclosure of fractures and pathology, but this excerpt does suggest that, where the radiographer's radiographic interpretation leads them to decide that an identified radiographic abnormality represents something other than a fracture, then radiographers refrain from any disclosure to the patient. An answer to the discrepancy may be found in the literature when viewed from the perspective of the giver of the diagnosis. The literature revealed that the more severe the abnormality identified by both radiologists and clinicians, the more they supported a trend away from disclosing a diagnosis to a patient (Levitsky et al., 1993). This is also consistent with the findings from the questionnaire where 83.3% (n = 35/42) of the radiographers who replied that they have provided a patient with their radiographic

¹²⁸ Ca is an abbreviation for cancer

opinion, indicated that such disclosure was dependent upon the diagnosis. Some of the comments that radiographers provided, in the questionnaire data, with regard to the factors that determined their decision to supply their radiographic opinion to the patient included:

I will let them know if I see a #¹²⁹. For complicated diagnosis I suggest they speak to their Dr.

Obvious results given to pt if they ask eg: #. More complex results not given - Dr should do this.

While the excerpts demonstrate that rural radiographers believe that disclosure should fall to the referring clinician, it seems that when this is not possible, a language strategy is employed by rural radiographers as an avoidance of responsibility for disclosing diagnostic information. This strategy may have arisen as a perception of what model of disclosure is best for patients receiving a significant or life threatening diagnosis such as RR 1 Ca. A diagnosis of cancer is generally a profound and potentially life altering experience for the patient (Thorne et al., 2010) because in the communication of a diagnosis of cancer there may be an assumption on the part of the patient that the disease is painful, incurable and fatal (Morgan et al., 1985), or at least long term mean disability with a diminished quality of life (Kaplan and Frosch, 2005). Some of the radiographers professed a belief that where a patient is about to receive a significant and potentially life altering or indeed life threatening diagnosis, there is an ideal model for disclosure to patients.

The participants believe that in instances where a patient is to receive a significant diagnosis, then that patient requires more than a blunt admission of that diagnosis as the following excerpt reveals:

RR 5: And whether the timing is right. And the other thing is I firmly believe that patients who are going to get their death notices need counselling that's my personal view... I don't think you can just drop that off with somebody and expect them to go home and have lunch... Like I could see something on a film and say oh.... Well, you wouldn't, but you could see cancer on a film, now you can't go out and say to someone that you know you've got cancer because even though you may know there is a diagnosis there we know nothing about the treatment.

¹²⁹ # is an abbreviation for fracture

The data indicates that the participant radiographers believe that where a radiographic image reveals a radiographic abnormality that is consistent with a diagnosis that is potentially life altering or life threatening, such as cancer, then in these instances a patient requires information regarding treatment. Indeed the literature suggests that after receiving bad news, such as a diagnosis of cancer, a patient does want to know what is the next step (Harvey et al., 2007, Gilbert et al., 2011). A further difficulty that exists for radiographers with a diagnosis of cancer is that treatment options and prognosis are further complicated by the extent to which a tumour may have spread and the individual responses a patient may make to treatment (Costello, 2004). This uncertainty around diagnosis, treatment and prognosis can play a part in disclosure as this uncertainty can be offered as a reason for not revealing the truth (Tuckett, 2004). In an Australian study into communication of diagnosis, prognosis and treatment options of patients diagnosed with cancer, it was revealed that patients consider that the discussions around treatment options at the time of diagnosis are at least as important as the disclosure of diagnosis (Butow et al., 1996). Information regarding treatment options relieves the diagnostic burden (Salander, 2002) but radiographers are not treating physicians and so this is information that radiographers may not possess.

The model for disclosure proposed by the participants provided for more than just treatment options to be discussed with the patient: it also included support for the patient at the time of disclosure as the following excerpt demonstrates.

RR 5: So patients aren't going home and stressing and having to wait weeks and not knowing what to do like if they need after care or you know informing the family who ever comes with them it is largely the counsellor's role to ... basically keep them informed because it is just amazing as to how people really don't know when they have cancer or they have an illness what to do next because they are still suffering from the shock of the news

Research shows that patients can suffer shock from the news of a diagnosis. In particular, a diagnosis of cancer constitutes a period of both distress and turbulence for a patient that can even evoke a sense of terror (Thorne et al., 2010), and due to the emotional turmoil of a cancer diagnosis all patients require some level of emotional support (Gilbert et al., 2011). It appears that it may be partially due to a lack of support for the patient post-disclosure that sees radiographers avoid disclosures of a potentially

life threatening diagnosis, because the manner of communication and the support received by a patient at this time may impact on their experience of living with cancer (Thorne et al., 2010). The unrecognised nature of radiographer disclosure to patients means that there is generally no institutional support mechanism available for patients, and this appears to be a factor in the participants choosing to limit disclosure of pathology. However, a lack of support for a patient who is to receive a significant diagnosis is not the only factor that sees radiographers limiting their responses to patients. Rural radiographers are also framing their replies to patients in an attempt to minimise patients' worry.

(iv) Wanting to avoid causing the patient to worry

The participants are also avoiding a frank disclosure to their patients on the grounds that it may cause the patient anguish or distress. Participant radiographers' responses to patients' questions regarding diagnostic information seem to be worded in such a way as to not give a patient reason for undue concern about their imminent diagnosis as the following excerpt demonstrates.

RR 4: But I will even then say to the patient look I don't think your chest X-ray is quite right obviously your doctor sent you along for this ... but don't sort of I try not to give the patient the idea that oh they're going to die. You know it is sort of the way you go about saying it. ... obviously they're unwell or they wouldn't be going to the doctor. I often say look I'm not ... qualified to report them, I don't have a lot of that important medical background to deal with the clinical stuff to put it all together but you know it looks a bit, a bit like it may have bit of something going on there and leave it fairly loose... more often than not. If I have managed to speak to the GP first and it looks like they have got a raging pneumonia or something you know and of course they're coughing and so they have obviously got some sort of infective process if I have spoken to the GP I would probably use the word look you know it looks like you might have some consolidation or some infective change there we are waiting on the radiologist report and he will get back to your doctor but I try not to be, I try not to give them something that they're going to go home and worry about.

The decision making process undertaken by the participant rural radiographers prior to disclosure is clearly complex and multifactorial, but the intent appears clear. Rural radiographers want to avoid harming the patient by disclosing anything that might cause the patient to worry. Other healthcare professionals also often censor the

information that they provide to patients in order to shield the patient from the distress of receiving bad news (Fallowfield et al., 2002; Tuckett, 2004). When patients undergo a radiographic examination, their speculations about the results of that examination may well be worse than the truth (Vallely and Mills, 1990). The stress that a patient experiences as a result of diagnostic uncertainty may be alleviated by an immediate reassurance of a negative finding or explanation (Vallely and Mills, 1990) which can set the stage for the psychosocial experience of the patient and which may turn a diagnosis '...from an unanticipated flash of cataclysmic lighting to the ominous and rumbling thunder of an anticipated storm' (Thorne et al., 2010, p. 747). In the preceding excerpt, the radiographer is using vague rather than definitive language but also inferring to the patient that the radiographic abnormality identified by the radiographer is not life threatening. Furthermore the radiographer has also outlined some of the rationale for her decision making around disclosure to the patient. This rationale includes an estimation of the diagnostic gap, triaging of the patient, and a reading of the patient in an attempt to identify the language appropriate to use in order to minimise the patient's worry.

So far, this chapter has shown that radiographers understand responsibility for disclosure of information regarding the results of a radiographic examination to patients as the professional domain of the referrer. In some situations however, the diagnosis is clear, there is less room for error in radiographic interpretation and a low degree of risk to the patient, and in these cases radiographers are willing to take some of the diagnostic responsibility. Overall however rural radiographers are not always confident in their radiographic interpretation and this can limit radiographers' level of disclosure to patients. This gives rise to a number of *factors that modify radiographers' level of disclosure to patients*. To approach the task of disclosure, radiographers use various language strategies to filter the extent of the radiographic abnormality as their radiographic opinion and these strategies are now presented in more detail.

Filtered Truth

Clearly, rural radiographers are not making blanket full disclosure to all patients in all situations. It appears that the degree of disclosure by radiographers spans a continuum with full disclosure at one end through varying degrees of disclosure leading to

avoidance of disclosure at the opposite end. This continuum of disclosure allows radiographers to filter the truth in their replies to patients. As a continuum, the language of disclosure did not appear to have distinguishable separations, however in order to explain its application it is described in this study as having 3 stages: (i) language of full disclosure, (ii) language to minimise disclosure and (iii) language to avoid disclosure.

(i) Language of full Disclosure

When the factors that modify the level of disclosure permit an increase in the level of disclosure, then the participant radiographers have indicated that they will use language that will supply patients with a full disclosure of the identified radiographic abnormalities as the following comments demonstrate:

RR 4: I will say to the patient as it comes up, ... I think you've got a fracture here see this one here and here, now the radiologist will send his report to your doctor but I think I better get on the phone and let them know just in case they want to treat it a bit differently or something.

RR 9: Sometimes I mean especially if it is a fracture it's quite often patients will know if they have broken a bone and they will say is it broken and I will say yes...or no I don't think so

Both of these excerpts provide examples of full disclosure by the radiographers to patients about fractures. It appears that in these instances, the disclosure has passed through the perceived significance of the pathology identified on the radiographic image factor that may limit disclosure, and as a consequence the participants have not deemed it necessary to present anything other than complete disclosure of their radiographic opinion. It is not only the participants' perceived significance of the identified radiographic abnormality that they use to decide the level of disclosure. It appears that the participants will also use their relationship with the patient to assess the level of disclosure that they believe is appropriate despite the radiographic abnormality as the following excerpt demonstrates:

RR 8: ...I tend to be a lot looser if I know if they are friends of mine... because I know they won't take me to court and say you know you don't know what you are talking about... You know look ... Robert or whoever... You haven't fractured it you've probably done your tendons and really without an ultrasound I can't tell which ones you have done or

mate you haven't got pneumonia but your chest is a bit ordinary you know things like that...h you go friendship language you know.

In this instance the participant has suggested that he will provide not only a radiographic opinion of no fracture or pneumonia, but also offered an idea for a differential diagnosis or similar to the patient. All these excerpts are examples where, upon consideration of the factors that modify radiographers' level of disclosure to the patient, rural radiographers believe that full disclosure to the patient is appropriate. As already indicated, this is not always the case: after assessing the radiographic abnormality and considering the factors that modify level of disclosure, the rural radiographers sometimes believe it is appropriate to provide less diagnostic information to the patient. In cases where the factors that modify the radiographer's level of disclosure to the patient result in the radiographer deciding that it is appropriate for the level of disclosure to be reduced, radiographers are framing their replies so as to minimise disclosure.

(ii) Language to minimise disclosure

Where radiographers are deciding to limit their disclosure to patients, it appears there are three language strategies that they adopt: (a) white lies, (b) amorphous language and (c) radiographer's whisper. While radiographer's whisper and white lies fall within language to minimise disclosure, they are specific strategies adopted by radiographers for disclosure and are discussed individually in the following section.

(iia) White lies

In this study, rural radiographers appear to sometimes avoid telling the whole truth when disclosing information to their patient as the following excerpt demonstrates:

RR 2: Yeah a white lie... just like stretch the truth a little bit you know so that they... so that you are not telling them too much but they can get a result or you know.

Turning to the United Kingdom literature for insight into radiographers' disclosure to patients suggests that, in reply to patients' questions, a radiographer might lie. '...you need to be able to tell 'white lies'. I have to say 'the film is fine' (when I know there is actually a tumour)...' (Brown, 2004, p. 220). The radiographers in this

study, however, do not appear to be making false statements as suggested by Brown, (2004): the participants are not saying ‘the film is fine’ when it is not, but instead they appear to be avoiding the whole truth rather than lying as the preceding excerpt demonstrates. While a lie may be defined as ‘...the conscious decision to present information wrongly...’ (Freegard, 2007, p. 123), a white lie is ‘...a harmless fib...with pardonable motives...’ (Moore, 2005, p. 1383). This distinction needs to be noted because, while a white lie may be considered a lie, nonetheless the intent differs. The intent with a white lie is not to mislead but rather to protect the patient. A white lie in this instance may then be considered to be partial disclosure. Partial disclosure which is withholding diagnostic information, should not be considered a lie as it is not an untruth (Tuckett, 1998) but rather this nondisclosure is intended to reduce the burden of harm to the patient (Tuckett, 2006) and so avoid causing the patient worry.

Avoiding the burden of harm to the patient is evident in the following excerpt which demonstrates that in their disclosure to patients, radiographers may use language to hide the extent of the radiographic abnormality.

RR 2: Well oh yes, no it would always be a little one I mean their whole left lung might be collapsed and I would just say it is just a little one... those white lies.

Here the participant radiographer has not said that the radiographic images are fine, which would indicate (according to Brown’s scenario) that they do not contain a significant radiographic abnormality. Rather, the white lie that the Australian rural radiographers are using is to use minimising language to obscure the extent of a radiographic abnormality rather than to offer a lie. Consequently radiographers are using words such as *little*, *some*, *bit* and *small* in their disclosure to their patients to describe a radiographic abnormality, regardless of the actual extent of the abnormality, to avoid causing the patient worry.

Further examples of a white lie were identified in this study where it can be seen that fractures become *cracks* or *little* and cancer becomes a *shadow* as the following excerpts reveal:

RR 1: I’ll whisper to the patient I think that you might have a crack

RR 3: I’d say you know as far as I can see I think you have a little ... you know a small fracture or a fracture

RR 3: And ... there is an area on the lung that looked very consistent, well, very consistent with being a cancer and ... he asked me what was there and I said well there is a shadow there but ... I think they will probably do further investigation for and ... I said I don't know exactly what it is but I imagine you'll probably come back for a CT or something like that ... and they will investigate it further and find out exactly what is going on.

Clearly the participant radiographers are using white lies but are not lying to their patients. In attempting to avoid causing the patient worry while maintaining a level of honesty, radiographers are not offering an untruth but rather disclosing a version of their radiographic opinion aimed at reducing the burden of harm to their patient. RR3's comments contrast with RR 1: *Yeah, yeah, not anything, wouldn't tell any pathology type things only fractures.* Placing the preceding comment in context, RR 3 is discussing the radiographic image that resulted from performing a radiographic examination on a family member. In this instance the radiographer has assessed the patient and, as a consequence of the patient being known to him, appears to have increased the amount of information disclosed to this patient, so while the patient has not received a full disclosure, he has still received some diagnostic information. The language captured in the interviews and used by the radiographers is consistent with the language identified in the literature, where the use of a diminutive such as *little* or the preferential replacement of the word *cancer* by the word *lump* by those involved in discussions with patients has also been noted (Goldie, 1982). In the preceding examples, the radiographers were using diminutive language to smother the extent of an identified radiographic abnormality. White lies are diagnostically accurate albeit clouded by diminutive language; however the other two options, amorphous language and radiographer's whisper, which radiographers appear to be adopting, do not employ language indicating the nature of the radiographic abnormality.

(iib) Amorphous language

The rationale for radiographers' adoption of language that obscures the extent of a radiographic abnormality has been discussed. Another language strategy that the participant radiographers employ is to use indeterminate language in disclosure of their radiographic opinion.

Where the participants have decided it is appropriate to use language that will minimise their disclosure to their patient, they may be employing amorphous language to obscure the nature of the identified radiographic abnormality as the following excerpts demonstrate.

RR 1: Sometimes they will say something and I'll say yeah a bit of wear and tear

RR 4: I would say I don't think it's quite normal

RR 2: yes, you have done a little bit of damage

RR 4: you know it looks a bit, a bit like it may have bit of something going on there and leave it fairly loose.

Again the participant radiographers can be seen to be using language to minimise disclosure of the extent of the radiographic abnormality by being diagnostically vague. It has been suggested that providing a patient with an answer does not necessarily require the 'blunt truth', the 'naked truth', or the 'dry cold facts' (Beauchamp and McCullough, 1984, p. 16), but rather that a healthcare professional taking into account the welfare of the patient may 'drip feed' the truth. (Costello, 2004). In these examples the radiographers have drip fed the truth. The truth may be that the radiographic image contains a radiographic abnormality and so by definition the anatomy displayed is not *quite normal*, however the information disclosed by the radiographer is diagnostically vague. On the basis of such disclosure, the patient has received a drip of the truth and is aware that the radiographer has identified a radiographic abnormality on their radiographic image. Although in these examples the radiographers have indicated that they would reply to the patient, the language that the radiographers have used has resulted in both the nature and the extent of the radiographic abnormality being unclear. Diminutive language is also used, but in these cases it does not precede a diagnostic term but rather a vague statement alluding to injury or illness. This is not the only language strategy adopted by radiographers to minimise their disclosure. Another diagnostically vague strategy that radiographers employ is the radiographer's whisper¹³⁰ (Willis, 1994).

¹³⁰ The radiographer's whisper is a term coined by Evan Willis but it has been adopted for this study.

(iic) Radiographer's whisper

Another strategy that the participant radiographers seemed to employ for disclosure to patients, is to use language to allude to the existence of a radiographic abnormality on the patient's radiographic images without actually revealing what that abnormality is, as the following excerpt shows:

RR 2: Yeah, yeah ... look you know I wouldn't go kayaking this weekend you know.

Evan Willis (1994, p. 23) is a sociologist who argues that the most information a patient may expect from a radiographer prior to a radiologist reading a radiograph, is the 'radiographer's whisper'. This excerpt fits well with Willis' radiographer's whisper where the example he provided was of a radiographer replying to a patient 'well I don't think you'll be playing sport again for a few months' (Willis, 1994, p. 23). When radiographers employ the radiographer's whisper they are not revealing the radiographic abnormality. The radiographer's whisper does not contain diagnostic information but rather the radiographer reveals that the consequence of the radiographic abnormality identified is that the patient will not be able to continue his or her usual activities. The radiographer's whisper is not a disclosure of diagnosis, but rather the radiographer offering a vague statement alluding to the repercussions of sustaining an injury or illness.

RR 8: ...I might say to someone or if they are constipated then it is obvious what is causing their pain I might say look you really needed a bit of a wash out just as a joke there are ways of doing things

In this section the approaches that radiographers use to minimise disclosure have been outlined. The white lie sits alone in that it is diagnostically accurate albeit framed in language that obscures the extent of a radiographic abnormality. The other two language strategies, amorphous language and radiographer's whisper, are both diagnostically vague. The described language strategies that the radiographers are employing show radiographers withholding information and using only partial disclosure. These strategies are not intended to mislead the patient which is the test of the moral question of establishing the truth (Teasdale and Kent, 1995); this is why in this thesis these language strategies have been defined as filtered truth. Furthermore, all

strategies where clinical information has been translated into language that will minimise patient worry also prepare the patient for the definitive diagnosis (Gilbert et al., 2011). One possible interpretation of radiographers relying on the radiographer's whisper, amorphous language or white lies is the lack of guidelines and inaccurate representation of the legislation guiding radiographic practice in relation to disclosure. However, radiographers' use of strategies like the radiographer's whisper and white lies shows how culturally bound and tacitly based some rural radiographic practices are. Because there is limited literature explicitly examining these language strategies in rural radiographic practice, they appear to be local solutions to widespread tacit knowledge. Furthermore rural radiographers' truth-telling preferences and practices may be considered cultural artefact (Tuckett, 2004). It is history, context and culture that is the source of rural radiographers' patterns of behaviour and how they view truth (Crotty, 1998).

These three language strategies outlined under the sub-theme *language to minimise disclosure* represent the approximate middle ground of the disclosure continuum. As the factors that modify radiographers' level of disclosure work to impose limitations on that disclosure, radiographers' replies to patients move towards language to avoid disclosure.

(iii) Language to avoid disclosure

In situations where the factors that modify radiographers' level of disclosure to patients result in radiographers believing that it is appropriate to reduce their level of disclosure to non-disclosure, rural radiographers are avoiding disclosure of their radiographic opinion and so patients are not provided with any diagnostic information.

RR 2: most of the time I just jolly them along and say look I don't actually read the X-rays our doctor does that, I've taken the X-rays I've made sure that all of the anatomy is on there and we've got really good pics and ... I am sending them to the doctor now. You'll go home and you will take the X-rays with you and your doctor will have a result tomorrow lunch time. So I just jolly them along and sort of say I've done my bit we've got really good pictures everything is on there, pass it on to the radiologist.

It appears that radiographers may offer a response that incorporates their documented job description as a means to avoid disclosure of radiographic abnormality to the patient. The tactics used by radiographers to avoid disclosure on the basis that radiography is a technical endeavour that incorporates only image acquisition, is in complete contrast to rural radiographers' construct of their practice world. All radiographers' behaviours described throughout the findings chapters are clearly based upon the centrality of the patient to rural radiographic practice. Rural radiographers are using the perception of those outside the field that radiography is a technical endeavour, where radiographers are only responsible for image acquisition, as a means of avoiding disclosure to avoid causing the patient harm. The radiographer's rationale for avoiding disclosure in the following excerpt appears to be the radiographer's perceived significance of the pathology identified on the radiographic image which imposes a limitation on her disclosure.

RR 2: No, because I knew him. I just...that was one of the cases where I just when Oh that's it... you know you got to bite your tongue. You think oh goodness I know this person, bite your tongue go back into the room and say oh, I've got lovely pictures today, ... and you don't sort of.... I would then act as if our X-rays report normally go back that day and sort of say oh look we've got a really quick turn around with films now, doctor will have it by four o'clock this afternoon give him a ring.

The participant radiographer's avoidance of disclosure is again consistent with other healthcare professionals who use non-disclosure as a means to protect a patient from emotional trauma (Kendall, 2006). Discussions about bad news are avoided because it might cause the patient harm, and so in some instance radiographers enact the 'paternalistic lie' and withhold or limit disclosure of information to their patients (Tuckett, 2004, p. 507). Culture determines the paternalistic stance that radiographers adopt because it is culture that shapes rural radiographers' concept of patient care (Berglund, 2004). Although the participant has chosen to avoid disclosure, this excerpt reveals that the radiographer's radiographic interpretation has led her to decide that there is an element of urgency: the radiographer has triaged the patient based upon the radiographic abnormality she has identified in the radiographic images. While the radiographer has avoided disclosure of the radiographic abnormality to the patient, she has nevertheless informed the patient he will only have to wait until four o'clock and then his doctor will have the results from the radiographic examination. The referrer

will then be in a position to provide these results to the patient, placing disclosure back into the hands of the referring clinician. It is excerpts such as this that reveal the complex multilayered decision making that precedes radiographers' disclosure to patients. The complexity of disclosure is further revealed in the following excerpt which appears to offer an explanation as to why radiographers may avoid disclosure.

RR 5: No. No. I think that is more to do with my personal feelings it's like it's way devastating for me to tell them there is a mass in their lung.

This finding is consistent with the field literature as other healthcare professionals may use non-disclosure as not just a means to protect the patient, but also as a means to protect themselves from difficult emotional issues (Tuckett, 2004; Kendall, 2006). Healthcare professionals may maintain an emotional distance from their patients as a means of self-preservation (Tuckett, 2004). It appears that disclosure difficulties for rural radiographers may be compounded when they know their patient. For example, earlier it was revealed that where a radiographer has a pre-existing relationship with a patient, this may positively impact on the radiographer's disclosure to the patient. This is clearly not always the case and it seems that perceived significance of the identified radiographic abnormality may override the leeway in language afforded by knowing the patient as the following excerpt reveals.

RR 6: No, no, no, no, it's not about revealing some people pursue it quite vigorously and you either have to say well I am not going to tell you or you follow it up with your GP or you know whatever you are going to say but ... some of it's about not really wanting to tell an acquaintance or a friend that you think that they have got a life altering episode happening.

In the preceding example the radiographer avoided disclosure and it appears that the motivation for such action is offered by RR 6, *some of it's about not really wanting to tell an acquaintance or a friend that you think that they have got a life altering episode happening*. This is consistent with the results from the questionnaire data where one of the comments that was provided in answer to questions about issues that X-raying people whom they know raise for them was *emotionally difficult if possibly serious problem*. Although it has been shown that knowing a patient may lead a radiographer towards a greater level of disclosure, it may also reduce that level of disclosure when there is significant pathology. Another factor that

radiographers may apply to their decision to filter their disclosure is evident in the following comments.

RR 6: Commonly unless I was particularly certain about it I would say look the films haven't been reviewed by the radiologist and ... whilst I am not saying you don't and I am suggesting you need to follow it up and the report will be there tomorrow that type of response.

RR 9: I just say I am not qualified to read the well look I don't actually say that sometimes more often than not I will say I am really not confident in looking at these sorts of things in an interpretation way and you know you are better off going back and getting a result from your doctor.

In these examples the radiographers are informing patients that they are not certain about the diagnostic content of the patient's radiographic images rather than providing the patient with their radiographic opinion. Not always being confident in their radiographic interpretation is clearly a deciding factor which applies to disclosure to patients as well as communication with referrers. Radiographers appear to adopt this strategy in order to avoid disclosure to patients where the factor that drives them to limit their disclosure appears to be their perception of the significance of the pathology identified in the radiographic image. Any of the factors that modify radiographers' disclosure to patients may increase or decrease the amount of diagnostic information a radiographer will disclose to their patient. The language used by a radiographer does not necessarily reflect the factors that may have acted to limit their disclosure to their patient, again revealing the complex and contextual nature of rural radiographers' interactions with their patients.

Summary

The nature of their working environment sees rural radiographers having to make decisions about disclosure of their radiographic opinion to their patients. This chapter has illustrated the strategies that radiographers adopt and the complex decision making process involved in radiographers' disclosure of their radiographic opinion to their patients. The consequence of a radiographer's patient focus is that, despite the lack of a legal or professional framework for radiographers to follow, rural radiographers appear to have constructed their own decision making framework in order to navigate this

neglected aspect of their practice. These are complex decisions for radiographers as patients have a moral right to know the truth although, as demonstrated, the truth is not absolute. Disclosure is not simply based upon whether there is a radiographic abnormality or not, and this highlights the quandary of disclosure for rural radiographers. It is context and culture that influence radiographers' sophisticated multifactorial communication styles and preferences. Rural radiographers are balancing their obligation to tell the truth against causing harm to the patient by the delivery of bad news with the result that radiographers' level of disclosure is linked to what they believe is best for the patient. It is on the basis of their belief in the centrality of the patient that rural radiographers decide the level of truth that is best for their patient. Radiographers are providing patients with a filtered version of the truth. The factor that is decisive in determining that level of disclosure is context; as a respondent to the questionnaire commented, a radiographer's disclosure to patients is *completely dependent upon circumstances*. In the next chapter the strategies that rural radiographers have adopted are theorised in order to provide some understanding of why radiographers have adopted these particular strategies.

Chapter 7: Discussion of the Findings

Introduction

Rural radiographers' involvement in the contested ground of radiographic interpretation leads them to use an array of strategies to convey their radiographic opinion to colleagues and patients. Rural radiographers are well recognised for performing core tasks such as image acquisition, but this thesis shows how their professional role extends beyond this technical expertise (Hall and Davis, 1999) to include complex humanistic dimensions. In their interactions with referrers and patients, radiographers are immersed in situations related to interpretation, communication and disclosure for which they are rarely formally qualified and for which they receive little or no explicit guidance. Indeed, radiographic interpretation and communication of their radiographic opinion was effectively removed from their scope of practice in 1925 (Price, 2001): however, rural practice demands these skills and the ambiguity surrounding professional responsibility means that in radiography, these skills have become hidden and are rarely spoken about. Nevertheless, the skills of image acquisition, radiographic interpretation, communication and disclosure of radiographic opinion combine technical and humanistic aspects within the role of the rural radiographer. In the absence of clear role delineation, policies and procedures, and legislation, radiographers have devised a number of strategies to negotiate their way through this contested and ambiguous ground. These strategies have been identified, described and interpreted in chapters 5 and 6. In this chapter, the strategies that rural radiographers have adopted are theorised using an overarching ethical lens to provide some understanding and explanation of these humanistic dimension of rural radiography.

Diagnostic Gap Discussion

Rural radiography is a complex humanistic field that is fraught with legal and ethical challenges. The way in which radiographers respond when confronted with a challenging situation is a product of their personal and shared history (Berger and Luckman, 1966), because knowledge that is historically and culturally relevant and which has been generated from social negotiation within a profession will ultimately

lead to action (Koro-Ljungberg, 2008). The patient focussed nature of radiography within a challenging situation led to the development and implementation of the red dot¹³¹ system in the UK. The red dot system alone does not seem to be sufficient for rural radiographers to effectively communicate their radiographic opinion to referrers. Australian rural radiographers have therefore adopted strategies to respond to the need to implement an effective communication strategy because

Both motives and actions very often originate not from within but from the situation in which individuals find themselves.

Karl Mannheim (1940) cited in (Wright Mills, 1940, p. 906)

As this quote by Mannheim suggests, radiographers' actions and reactions to a given situation are contextual. In this study it has been demonstrated that the context that creates unique situations that force radiographers into the practices of radiographic interpretation, communication and disclosure is the diagnostic gap and its implications for patient care. When a patient arrives for a radiographic examination, a provisional diagnosis may exist for that patient proffered by the referring clinician, but once the radiographic image is processed the radiographer potentially holds in his or her hands a definitive diagnosis. Rural radiographers are situated between their patients and the referring clinician. Rural radiographers are standing in the diagnostic gap.

The strategies rural radiographers employ in order to attempt to close the diagnostic gap so as to be able to meet the treatment requirements of the patient, are to follow standard procedures of alerting the radiologist and/or using the red dot where it is in use. The blanket application of such standard procedures has presented problems for radiographers, because standard procedures often inherently contain an inability to cope with a dynamic situation or to account for the social aspect of a given situation (Symon et al., 1996). The findings show these formal procedures do not eliminate the diagnostic gap and radiographers' understanding of their professional responsibility in disclosure mediates how they frame their replies to patients which is explored in the following section.

¹³¹ Red Dot system discussed in chapter 2, page 89.

Understanding disclosure to patients, truth telling and lies

Radiographers are often involved in conversations with their patients that require them to make decisions regarding disclosure of information. Decisions about how to frame their responses are complex because the ‘...patient has a moral and legal right to know the truth; how to tell it, and by whom, is the problem’ (Schreiber and Winslade, 1987, p. 269). Such decision making may be resolved by referring to legal and professional frameworks, experience or intuition or under the guidance of others (Hodkinson, 2008). However, as revealed in the literature, there is no legal or professional framework for radiographers’ disclosure to patients. The apparent result of this confusion around the legality of disclosure by radiographers was reflected in the findings with 50% (n = 30/60) of the radiographers indicating a belief they will be held medico-legally responsible for disclosing their radiographic opinion and the other half almost evenly divided between ‘no’ 25% (n = 15/60), and ‘don’t know’ 23.3% (n = 14/60). The gap in the literature surrounding this topic suggests that radiographers’ disclosure to patients is not recognised and as a result professional frameworks such as the *AIR Guidelines for professional conduct for Radiographers, Radiation Therapists and Sonographers* fail to provide guidance for this aspect of radiographic practice (Australian Institute of Radiography, 2007). A definitive answer to the question of radiographers’ legal standing with regard to disclosure to patients could not be identified, although the identified radiography literature seems to lean toward there being no legislative impediment to radiographers’ disclosure to patients. Commentators such as Collins (2008) and Willis (1994), however, appear to be actively dissuading radiographers from commenting by citing the existence of legislative restrictions on disclosure by radiographers which could either not be identified or appear to have been misrepresented. This lack of a guiding framework leaves radiographers to rely on informally acquired tacit and cultural knowledge to inform their disclosure to their patients.

It has been suggested that where their legal standing is unclear, radiographers must be turning to their personal and professional ethics for guidance (Lynn, 1999). The problem that exists for radiographers is that ‘[n]o...professional code of ethics has

successfully presented a system of moral rules free of conflicts or exceptions...’ (Beauchamp and Childress, 2001, p. 15). Professional codes of ethics have a place within the ethics arena because they do provide a level of guidance, even if that guidance may be found to be not only incomplete but that the codes may be interpreted differently by different individuals (Berglund, 2004). The ethics of rural radiographers arise from their moral obligations to their patients as they engage in disclosure because the ethics of a profession are more than a professional code of ethics. The ethics of a profession include the moral obligations that result from the activities in which the professionals are engaged (Pellegrino and Thomasma, 1993). It has been recognised that people sharing a common cultural context also share a ‘common morality’ (Beauchamp and Childress, 2001, p. 3; Johnstone, 2009). The findings show that rural radiographers are driven to do what is best for the patient. A common morality however may not be adequate for operating safely within the complex ethical issues that arise in rural radiography and requires a more sophisticated level of ethical competency.

Radiographers’ working environment clearly affects both their ethical behaviour and their actions (Lewis, 2002, p. 155) and a strong foundation in ethics is necessary in order to resolve a problem but still maintain ethical integrity (Mundy, 1999). This is of concern when, according to Lewis, there is a lack of both awareness and openness within radiographic culture and literature in the ethical discourses surrounding radiographic practice (Lewis et al., 2008). It has been suggested that the culture of the radiographic workplace inhibits radiographers from ‘exhibiting ethical sensitivity’ (Lewis, 2002, p. 155) because the ethical commitment of radiographers is stifled by their unequal working relationship with both medical practitioners and radiologists (Lewis et al., 2008). The findings from this study show however that the participants were primarily concerned about their legal responsibilities within a strong framework of quality and safety for the patient. It was this concern for patient welfare that underpinned their decisions about interpretation, communication and disclosure, but at the same time their actions were always framed within a concern for ethics and the law.

All healthcare professionals are faced with ethically challenging situations (Nilstun et al., 2001; Lewis et al., 2008) and the rural environment adds a further dimension to the ethical debate (Turner et al., 1996; Cook et al., 2001). Specifically, the familial relationships that the findings have indicated exist for rural radiographers with

90% (n = 54/60) of the respondents living in the same community in which they work and only 3% (n = 2/60) indicating that they never encounter family or friends as patients, contribute to the ethical debate. One concept central to ethical dilemmas in the rural environment is a conflict between commitment to personal values and professional responsibility (Turner et al., 1996). Colleagues, supervisors and ethics experts are often not available to rural practitioners and if they are, they may not be cognisant of the subtleties of life in small communities with the result that rural healthcare providers may feel that any sources of information about ethical dilemmas are so urban biased that they are unhelpful in remote communities. Furthermore, the multidisciplinary practice that often exists in rural areas does not necessarily reduce ethical difficulties as ‘...the boundaries between medical and nursing ethics will continue to blur as decision-making concerning patient care becomes more a task for the health team rather than a matter for specific health professionals’ (Mitchell et al., 1996, p. 10). As a consequence, rural radiographers as healthcare professionals are adopting their own rules about the way they formulate their replies to patients in an attempt to respect their ethical responsibilities while still providing the patient with information. One way that radiographers exhibit ethical sensitivity is through filtering the truth which is explored in the following section.

Radiographers filtering the truth

Clearly there are moral obligations to rural radiographers’ participation in disclosure to their patients. Although the participants in this study indicated that in reply to a patient’s request for diagnostic information they like to be honest, it appears that radiographers are not holding onto the legal maxim of ‘the truth, the whole truth and nothing but the truth’. The concept of truth¹³² with regards to radiographers disclosure of their radiographic opinion to their patient is further complicated because it is based upon their radiographic interpretation. Radiographic interpretation as discussed in chapters 1 and 2 is subject to uncertainty and bias (Christensen, 2005). As such radiographer’s radiographic opinion is subject to the uncertainty principle. The uncertainty principle is based on the premise that because there is no certainty in diagnosis or prognosis there is no absolute truth (Tuckett, 2004). It has been proposed

¹³² For the findings relating to truth please see chapter 6 page 236.

that absolute truth is 'rarely achieved in medicine and therefore what is required is an open honest presentation of information as it is perceived and known' (Drickamer and Lachs cited in Tuckett, 2004, p. 508). Therefore for this study truth will be considered to be based upon what a radiographer believes to be an accurate interpretation of a patient's radiographic image.

From the findings it is evident that, based upon their radiographic interpretation, these radiographers are offering filtered truth and limiting their disclosure to patients to the amount of truth that they believe is appropriate for that particular patient, at that particular time. Truth telling in radiographers' construction of a radiographic opinion in their disclosure to their patient is, therefore contextual (Tuckett, 2006). Telling the truth is also an ethical concern and so radiographers' disclosure to patients which incorporates telling the truth can be seen as an ethical problem (Tuckett, 2004). The arguments both for and against telling the truth are framed in terms of autonomy and physical and psychological harm to the patient (Tuckett, 2004). As a consequence of the contextual nature of telling the truth, the radiographers will often censor the information that they disclose to a patient in order to protect that patient from hurtful or bad news (Fallowfield et al., 2002).

The complex ethical nature of rural radiographers' involvement in disclosure is demonstrated in the findings where it is evident that radiographers are assessing the vulnerability of their patients with regard to full disclosure by determining how well they believe a patient will cope with the information to be disclosed. As healthcare professionals, rural radiographers must balance the obligation to tell the truth against doing harm (Sullivan et al., 2001), where the potential for psychological harm to the patient is assessed by the radiographer reading the patient. Radiographers' adoption of language to minimise disclosure and language to avoid disclosure may be understood within the ethical principles of beneficence and non-maleficence. These principles guide radiographers to avoid telling the truth where it involves bad news as this may cause the patient distress (Tuckett, 2006).

Telling the truth, however, involves more than just the ethical principles of beneficence and non-maleficence. Telling the truth also encompasses patient autonomy (Beauchamp and McCullough, 1984) and there is a debate within ethics as to whether

autonomy or beneficence should have priority (Berglund, 2004). If there is a belief that informing the patient will cause harm, then a moral dilemma exists that involves possible harm to the patient versus patient autonomy (Sullivan et al., 2001) and in these situations models of beneficence will often give way to autonomy (Berglund, 2004). In such cases, autonomy demands the patient's right to know which must be weighed against the potential of a harmful effect of disclosure (Beauchamp and McCullough, 1984). The study showed that radiographers are not always providing full disclosure to their patients, therefore radiographers are not guided solely by patient autonomy. It appears that for radiographers, patient autonomy is not the overriding obligation.

It is the ethical framework constructed within the practice world of the rural radiographer that determines the priority afforded to telling the truth and thereby respecting a patient's autonomy weighed against the potential for harm to the patient resulting from disclosure. As healthcare professionals, rural radiographers balance the obligation to tell the truth against the imperative of avoiding harm to the patient (Sullivan et al., 2001). Rural radiographers' construct of their role in patient care may not allow full disclosure of their radiographic opinion to their patient because patient care is an integral dimension of radiographic practice (Lam et al., 2004) and the radiographers have revealed that they want to do *what's best for the patient* (RR 1). Rural radiographers' strategies to minimise and avoid disclosure arise because, if radiographers were to adopt a model where autonomy is assigned primacy, this would challenge the role of the rural radiographer to do what is best for the patient (Berglund, 2004). The complex and contextual nature of decisions around disclosure to patients is demonstrated in the following:

Each situation is different and, therefore, the application of dogmatic rules and general principles is inappropriate because they do not acknowledge nuances...Critics of the application of general rules often point out the difference between lying to a competent patient, who is not very ill and wants answers to straightforward questions, and lying to the near-death patient with a cardiac arrest who asks 'will I live?'. White lies and expressions of uncertainty are merely acknowledgements of the nature of a particular situation. They demonstrate that telling the truth in all cases in the assumption that it is 'right', is a heartless, inhuman basis for guiding behavior. That is not to say that in lying to a gravely ill patient, for example, a health professional does not experience a dilemma.

Lewins (1996, p.33)

As this quote by Lewins reveals, disclosure to patients is contextual and the protection of the interests of vulnerable patients with regard to information disclosure is the ethical responsibility of healthcare professionals (Pang, 1999). There are difficulties associated with assessing the vulnerability of a patient and also with establishing criteria that could successfully be applied in clinical practice. A competent person may be judged as one who has the capacity to make a rational decision, but this very same person may still carry the burden of emotional or physical strain from illness that can result in them being unable to bear the burden of some information (Pang, 1999) which makes assessment contextual (Fulbrook, 1994).

Assessment by a health care professional of the ability of a patient to receive information is not quantifiable, and, although it may benefit from provision of a guiding framework, it may just be that it requires intuition (Eraut, 1994, Fulbrook, 1994). This may explain participants' comments such as *because I can tell that somebody is going to handle it fine* because it demonstrates radiographers' ethical sensitivity in how they formulate their disclosure. This indicates the role of tacit knowledge in understanding people and, due to the ethical nature of disclosure, indicates a level of ethical expertise. In addition to a tacit understanding of people and their ability to handle a radiographic opinion, rural radiographers may have knowledge of their patient from previous experiences within their rural community. Patients and healthcare professionals will often share more than a healthcare professional/patient relationship. Rural radiographers live in the community with their patients and so they may have known their patients for years, and may even be related, thus potentially increasing the radiographer's knowledge of that patient. A radiographer's behaviour towards a patient is based on their aggregated knowledge of that patient where the aggregation incorporates a tacit processing of incidents and encounters that contribute in ways that even radiographers cannot fully apprehend (Eraut, 2011). As one of the participants concluded, *it just comes with experience*.

The preceding section shows how radiographers demonstrate ethical sensitivity in their disclosure practices. The practice of filtering the truth in disclosure is an informal practice that radiographers have devised; however it is an informal strategy that is not recognised or conventionalised by managers (Symon et al., 1996). Allin et al. (2011) argue that such practices are often not widely formalised but in fact have been

allowed by senior medical hierarchy. While this explains why disclosure has been sustained as a hidden practice in radiography, it also suggests there are other factors that mediate radiographers' conveyance of their radiographic opinion. In other words, there is a complex interplay of factors that extend beyond the rural context and radiographers describing how they approach conveying their radiographic opinion. Bruce Harvey has provided a possible answer, namely '...medical hierarchy...' (Allin, 2011, p. 7), because it is constructions of the world built around power relations that influence what people are allowed to do and also how they may treat others (Burr, 2003). Medical hierarchy and the impact that the interwoven nature of the rural working environment may have on the communication strategies that rural radiographers adopt with referring clinicians is examined in the next section.

The hierarchical nature of Australian radiology

The findings presented in chapter 5 suggest that radiographers' working practices are impacted upon by the hierarchical model of Australian radiology that has been in place since the 1920s (Smith and Baird, 2007, p.629). Although technology, patient population and clinical pathways changes have resulted in an increasingly complex environment (Walton, 2006), the medical hierarchy which is the organisational structure for hospitals and was the working environment for 66.7% (n = 40/60) of the rural radiographers in this study, has remained substantially unchanged (Freidson, 1988; Willis, 1989; Walton, 2006). Sociologically, medicine has dominated radiography which, because of the invisibility of the social and humanistic dimension of radiography, has been largely viewed as a technical occupation (Decker and Iphofen, 2005). History reveals that the apparent contemporary delineation between radiographic image acquisition and radiographic interpretation¹³³ is an artificial separation for rural radiographers. Medical practice is not disparate from those tasks of the non-medical healthcare staff such as radiographers: that is, it is not what the doctor does that forms the technical division of labour, instead it is medicine's control over the division of labour that is notable (Freidson, 1988).

¹³³ Radiographic image acquisition and interpretation are discussed in chapters 1 and 2

Many of the tasks that are now undertaken by non-medical healthcare personnel were once domain of the doctors themselves (Freidson, 1988). Radiologists were once their own radiographers (Jerman, 1930), performing the very image acquisition duties now tasked to radiographers, and early X-ray technicians who were more familiar with the production of radiographs than many doctors were interpreting films (Larkin, 1978). Ryan, Sutton and Baigent (1996) document notes from Bruce Innes, an historian and former Chief Radiographer at Bathurst Hospital where he writes:

Clinical acumen was more important than understanding film. A good clinician could get 'hard' information from vague 'images' if he/she had clinical expertise. The radiographers were the clinical observers, more than 50 years ago.

(Ryan et al., 1996, p. 189)

Radiographic images were interpreted and reported by non-radiologists for over two decades prior to radiology evolving as a separate speciality (Nuss, 2007). The reporting of the radiographic images by radiographers recognised that these radiographers held specialised knowledge and skills and that they adopted a responsibility and accountability for their patients (Price and Paterson, 1996). In early discussions about radiographer reporting, no evidence of incompetence is tendered but instead subordination was argued on the basis of professional authority, maintaining the Medical Acts and protection of the public (Larkin, 1983). A framework provided by Freidson (1988) and Willis (1989) shows how radiography is in a position where medicine exerts its authority over radiography based upon subordination¹³⁴ and supervision. The medical profession promoted the view that radiographic interpretation required medical training even if that training had contained little or no radiology or

¹³⁴ The ongoing success of the medical profession has also been attributed to the political and cultural influence of its male members rather than just the possession of knowledge (Yielder, J. 2006). The subordination of radiographers has been attributed in part to gender (Decker, S. & Iphofen, R. 2005). In the 19th and early 20th centuries, which is also the timeframe for the evolution of radiography, the medical profession was largely male (Fahy, K. 2007). Radiographers, however, were often recruited from nursing which has historically been a predominantly female occupation (Decker, S. & Iphofen, R. 2005). It appears that even now radiography is a predominantly female occupation with data from the 2006 census revealing that 69.5% of Medical Imaging Professionals were female (www.abs.gov.au accessed 16/11/2009). Gender analysis of the radiographers who took part in this study revealed that 28.3% of the respondent radiographers were male and 71.7% of the radiographers were female which demonstrates the same whole numbers ratio of 2:1 as the census data. The rural radiographer participants in this study were predominantly female.

even if it was undertaken prior to Röntgen's discovery (Larkin, 1978). This continues today, where in the absence of a radiologist's report the ultimate responsibility for radiographic interpretation falls to the referring clinician regardless of the referrer's radiographic interpretation knowledge.

Some commentators argue that the key to the analysis and explanation of both the social structure and the organisation within contemporary Australian healthcare is medical dominance (Willis, 1989; Adamson et al., 1995; Kenny, 2004; Willis, 2006). Medical dominance is well documented in the literature. Medical dominance in Australia was established with legislation in 1908 and consolidated by further legislation in 1933 (Willis, 1989). The implications of this timeframe are not just that the hierarchy preceded radiography but also that radiography evolved within the timeframe of the biomedical model. This dominant structural position of medicine has been maintained through statutory registration legislation (Willis, 1989) and the supervision of radiographers by radiologists clause in the Medical Benefits Schedule has '...merely added to the subservience of radiographers and the dominance of the radiologist in the system' (Smith and Lewis, 2003, p. 38). Furthermore, it has been suggested that the ethical commitment of '...Australian radiographers is stifled by ...subordination...' (Lewis et al., 2008, p. 96).

The medical dominance over the division of labour may be explained by medicine's control over the knowledge that provides the foundation for healing, the diagnosis (Willis, 1989; Yelder, 2006). A major factor in maintaining medical power is control over diagnosis (Porter, 1991; Yelder, 2006; Jutel, 2010). Radiographic images heralded a change in the techniques of diagnosis (Larkin, 1983). Visual evidence of structures previously hidden from the human eye was provided by radiographic images, and the ready availability of Crookes tubes did not require a medical practitioner to produce a radiograph. Radiographic images challenged the medical monopoly over the internal structures of the human body (Golan, 2004). For example radiographic images allowed a patient to see the extent of his abnormality prior to amputation (Rowland 1896) cited in (Pasveer, 1989, p. 361). Bone fractures and foreign bodies could be visualised (Pasveer, 1989) and diagnosed by non-medical personnel. The information necessary for the diagnosis of fracture, foreign bodies and abnormalities was indelibly etched on a radiographic image, and so radiographers who were often more familiar

with radiographic images than doctors presented a risk to the control over diagnosis as radiographers were in a position of control over information that could lead to diagnosis (Larkin, 1978). As a consequence of the threat of control over diagnosis, the knowledge in radiographic interpretation of those producing the radiographic images, was marginalised (Yielder, 2006). Radiography's historical evolution within biomedicine, which marginalised radiographers' radiographic interpretation knowledge, coupled with the notion that radiography is a technical endeavour, makes the task of rural radiographers responding to the ethical dilemmas of rural practice difficult, because the social and humanistic aspects of radiographic practice have been hidden.

The historical basis for medical dominance as a structural feature appears to have led to the subordination of radiographers. It is evident however, that social change is beginning to erode medicine's control over the healthcare system (Kenny, 2004). This change does not necessarily equate to substantive change in medical dominance: medical dominance still exists but its form and operation may have altered (Willis, 1989; Boyce, 2006). It has been suggested that some of the interactions in healthcare between doctors and nurses demonstrate equally valued participation in decision making (Benner et al., 1996a), but there is still evidence to support the contention that the medical profession continues to hold a significant level of power and authority although the boundaries that still exist between health professions have become less rigid and entrenched (Willis, 2006). It is not known how, within the culturally complex environment of evolving health workforce care models, rural radiographers coexist with other healthcare professionals, because the social practice of allied healthcare professionals such as radiographers has remained largely outside analysis (Boyce, 2006). Medical dominance therefore can still provide a theoretical and structural element for understanding (Boyce, 2006). The difficulty that exists for rural radiographers operating from within this structure, is that the unequal power relationship means that those who are positioned towards the base of the hierarchical pyramid, such as radiographers, might remain silent when they should speak out (Walton, 2006). The findings from this study however, suggest that despite being enmeshed within a medical hierarchy, rural radiographers are often finding a way to speak out, to construct a radiographic opinion with referring clinicians, albeit using the convoluted strategies described in chapter 5. Rural radiographers under the historical influence of the dominance of medicine and working in the practice world of the rural healthcare

professional seem to have constructed their own particular language game with referrers, that in this thesis is referred to as the *radiographer-referrer game*.

Radiographer-Referrer Game

Radiography tends to draw parallels with the nursing profession (Decker and Iphofen, 2005) and the nursing literature provides a framework that appears to explain radiographers' actions with referrers. The occupation of nursing emerged from the Crimean War (1854–1856) under the guidance of Florence Nightingale (Fahy, 2007). Nightingale established the role of the nurse based on the military stratification and so nurses were subordinated to medicine (Fahy, 2007) and were historically considered to be subservient to doctors (Porter, 1991). In 1967 Leonard Stein proposed that the interaction between doctors and nurses constituted a game (Stein, 1967). Stein coined the phrase 'doctor-nurse game' for this game (Sweet and Norman, 1995) where the object of the game is for a nurse to appear passive whilst showing initiative and making recommendations for patient care (Stein, 1967). A cardinal rule of the game is the avoidance of open disagreement (Stein, 1967) with the result that '[n]urses use subtle nonverbal and cryptic verbal cues to communicate recommendations which, in retrospect, appear to have been initiated by the doctor' (Sweet and Norman, 1995, p. 167). To this end, a nurse must make a recommendation to a doctor without appearing to do so and the doctor must concur without appearing to do so (Stein, 1967). The parallels between Stein's nurses and rural radiographers are apparent in the findings of this study when one considers the following excerpts drawn from the rural radiographer interviews.

RR 7: Let the doctor make the decision every time even though they don't know what decision to make.

RR 8: Maybe even and I often teach not that you can teach people personality but you even sort of give them give the young referrer or the referrer an opportunity by heading them in a direction and quietly saying now don't you think that looks a bit extraordinary or something like that there are ways to handle it.

At the time that Stein published his paper in 1967, nursing training was largely hospital based and so nurses' attitudes were shaped throughout hospital training (Stein et al., 1990); similarly radiographers were also traditionally hospital trained. Hospital

based training socialised nurses to accept doctors' authority (Stein et al., 1990; Sweet and Norman, 1995). Radiography training, like nursing training, has moved from hospital based to university based. The academic world in which training is now based is quite different and puts forward the concept that, rather than being subservient, the relationship between doctors and nurses is becoming more equal and collegial (Stein et al., 1990; Porter, 1991; Sweet and Norman, 1995). While institutions such as hospital and healthcare facilities '...by the very fact of their existence control human conduct by setting predefined patterns of conduct, which channel it in one direction as against the many other directions that would theoretically be possible', human behaviour is contextual and socially constructed (Berger and Luckman, 1966, p. 72). The result has been a reduction in, but not an elimination of, the playing of the doctor-nurse game (Porter, 1991; Sweet and Norman, 1995). As a result of the changing face of doctor and nurse interactions Sam Porter, following from the work of Stein, distilled from the relevant literature four types of interaction between nurses and doctors, namely unproblematic subordination, informal covert decision making, informal overt decision making and formal overt decision making (Porter, 1991). Porter then tested each type against the interactions in ward environments (Porter, 1991). Porter's four types of interaction may be used to provide some understanding of rural radiographers' behaviours, and to this end each of Porter's interactions is very briefly explained in the following section.

Unproblematic subordination involves a complete lack of nurse input into decision making as nurses obey medical instructions without question (Porter, 1991). Informal covert decision making is where nurses, under the pretence of unproblematic subordination, avoid open disagreement with doctors (Porter, 1991) by adopting behaviours that fit with Stein's doctor-nurse game. In the informal overt decision making category, nurses no longer defer to doctors and are overtly involved in decision making (Porter, 1991). While informal overt decision making involves cases where participation by nurses is both open and deliberate, it is not officially sanctioned (Manias and Street, 2001). The formal overt decision making category involves nurses holding a significant decision making role (Porter, 1991). The parallel that may be drawn between Porter's four types of interaction and the behaviour of the rural radiographers in this study is demonstrated in table 8. Porter's Four Types of

Interaction have been aligned with the comparable theme derived from the thematic analysis and a representative quote from the rural radiographer interviews.

Porter's Interaction	Radiographers' actions
unproblematic subordination	Referrers may ignore radiographers' radiographic interpretation <i>RR 7: Let the doctor make the decision every time even though they don't know what decision to make.</i>
informal covert decision making	Language games for communicating radiographic opinion to the referrer <i>RR 8: ...sort of give them give the young referrer or the referrer an opportunity by heading them in a direction and quietly saying now don't you think that looks a bit extraordinary or something like that there are ways to handle it...</i>
informal overt decision making	Communicating radiographic opinion to the referring clinician <i>RR 2: I am quite happy to ring them and say look your patient has got a pleural effusion...I am quite happy to do that or a fracture...</i>
formal overt decision making	The strategies that radiographers employ to alert the referring clinician <i>RR 6: ... if there is an abnormality in the films then we will red dot them and they can either come around and say what does that mean, does it mean what I think it means or tell me what it means ... and then they may well seek further advice after that.</i>

Table 8 Porter's Interactions compared with radiographers' actions

From the comparisons tabled above it appears that the rural radiographers in this study are entangled in their own version of the doctor-nurse game, the *radiographer/referrer* game, in the communication of a radiographic opinion with the referring clinician. Rural radiographers' actions however, are not only guided by medical hierarchy. The social and professional behaviour of rural radiographers is also defined by their ethical standing which in turn affects their decision making (Rassin, 2008) not just a medical hierarchy. In order to unearth how radiographers understand construction of their radiographic opinion with referrers, it is necessary to further unravel their behaviour. In cases where the radiographer has assessed that the length of the diagnostic gap will not negatively impact on the patient's health, or there exist significant factors that inhibit radiographers' actions to close the diagnostic gap, then radiographers are deferring radiographic interpretation to the referrer. In such cases radiographers appear to conform to the criteria for unproblematic subordinate as they appear to be subordinated to the referrer. The difficulty for radiographers is that unproblematic subordination is not unproblematic. Radiographers possess both skills

and knowledge that may contribute to effective patient care; however, as this study has shown, the skills and knowledge that rural radiographers employ in order to communicate with referrers have been acquired through informal pathways. In addition, the knowledge and skills upon which radiographers base their radiographic opinion and radiographic interpretation utilise knowledge and skills that have been acquired tacitly through informal pathways. Furthermore, the language and language skills that radiographers utilise in communication with referrers draws upon rural radiographers' knowledge of people which is formed through experience and the context in which the communication is to take place (Eraut, 1985). Despite the informal pathways for radiographers' acquisition of the knowledge that they employ for radiographic interpretation and communication, the radiographers do not remain impotent due to either the hierarchical structure of the healthcare system or the hierarchical posturing of some of the individuals involved because patient care may be compromised. Rural radiographers attempt to overcome the poor working relationships that may exist between radiographers and referrers because this relationship may have a negative impact on patient care (Sweet and Norman, 1995).

Patient care is central to radiography. As radiographers care for their patients it is their convictions of what is 'right, good or desirable' that motivates their behaviour (Rassin, 2008, p. 614). It is this concept of the centrality of values to healthcare professionals' decisions and actions (Rassin, 2008) that may explain why radiographers adopt a particular position on the specific issue of communication of their radiographic opinion. It would seem, on the basis of the negative impact that unproblematic subordination may potentially have on patient care that it would be the least utilised option chosen by the radiographers. The findings however reveal that this is not necessarily the case. Radiographers are only speaking out to a referring clinician if they are concerned that the referrer is going to miss the radiographic abnormality. If the abnormality is identified, then the radiographers remain silent which could appear to be unproblematic subordination. The findings from this study also demonstrate that rural radiographers adopt a stance that could be aligned to unproblematic subordination when the radiographer triages the patient, which includes interpreting the radiographic image, and concludes that either

- no significant radiographic abnormality exists or

- the radiographer is aware of a high skill level in radiographic interpretation held by the referrer or
- the timeframe for the diagnostic gap will not negatively impact on the patient.

Rural radiographers remain silent only if patient care is not at risk. In cases where communication difficulties exist or are perceived, then the radiographers only appear to move towards participation in decision making if a radiographic abnormality is not identified by the referrer. In situations where the referrer adopts an authoritative stance, radiographers may argue their radiographic opinion where they believe patient care may be compromised by a missed radiographic abnormality or an erroneous radiographic interpretation¹³⁵. Rather than adopting an argumentative approach, however, another method employed by the radiographer was the language games with referrers described in chapter 5. In these communication strategies, radiographers avoid confrontation with the referrer by hinting their radiographic opinion rather than straightforward communication as is seen in radiographer/referrer games equivalent of informal overt decision making. The radiographers provide clues to lead the referrer through radiographic perception and toward an accurate radiographic interpretation. This type of game playing has also been identified as occurring between doctors and other healthcare professionals. In interactions between doctors and nurses this type of game playing has been described as staging (Manias and Street, 2001). The game of staging involves a nurse selectively providing a doctor with information in order to lead the doctor to a specific decision (Manias and Street, 2001).

The findings and the field literature both indicate that referrers are requesting diagnostic input from rural radiographers. A referrer's request for input from radiographers may be seen to fit with Porter's informal overt decision making or indeed formal overt decision because the rural radiographers are actively involved in the decision making process. While rural radiographers' input into decision making may be significant, it is also not officially sanctioned unless the healthcare facility has officially adopted a RADS such as the red dot system. The use of RADS in Australian rural medical imaging departments appears to be limited and so it seems that there are few cases of formal overt decision making in rural radiographic practice.

¹³⁵ For an example see RR1 excerpt page 180.

One of the problems with medical dominance and the associated hierarchy is that it may inhibit individuals from speaking out (Leonard et al., 2004). Rural radiographers however, have adopted informal procedures for communication that rely more on social relationships than organisational roles. These informal procedures have emerged as a consequence of the social context of the work being undertaken (Symon et al., 1996). Sarah Armstrong, a British doctor undertaking her residency in Australia writes of the less formal Australian style that is ‘...a refreshing change from the strict, intimidating chain of command back home’ (Armstrong, 2008, p. 629). Perhaps it is an extension of the Australian style that breaks the obsequious nature of historical medical hierarchy and makes it easier for Australian rural radiographers and referrers to interact to construct a radiographic interpretation, thus making informal overt decision making a more easily adopted interaction between rural radiographers and referrers.

In Australia it has been proposed that the division of labour in healthcare can be described in terms of ‘imposed’ and ‘negotiated’ (Willis 1994). For example, in a large hospital in Melbourne, the rules state who may do what to whom, and so may be considered imposed, but in a small hospital in Bourke the rules are modified in order to cope with a current situation and so the rules are negotiated (Willis, 1994). This concept is supported by Willis’s research that found that the working relationship between Australian General Practitioners (GPs) and Practice Nurses (PNs) is the result of ‘...largely tacit negotiations between GPs and PNs’ (Willis et al., 2000, p. 245). These negotiations again demonstrate the socially constructed nature of the vertical and horizontal teamwork structures of collaborative practice (Wakerman and Lenthall, 2002). The vertical teamwork structure follows a hierarchy of authority similar to that of metropolitan hospitals as opposed to the horizontal structure where team members have similar levels of responsibility and authority (Wakerman and Lenthall, 2002). Furthermore a horizontal teamwork structure effectively flattens hierarchy and so creates an environment where individuals feel safe to speak out and participate in decision making (Leonard et al., 2004). It is this flattened hierarchy that appears to permit straightforward communication by rural radiographers.

Rural radiographers’ understanding of their practice world is historically and culturally specific (Burr, 2003). The historical basis for radiography has not changed, but a shared culture that has grown out of collaborative practice in the rural healthcare

environment may have impacted upon their practice world (Hall, 2005). Rural healthcare providers, such as referring doctors' and radiographers' constructions of their practice world, support some patterns of social action (Burr, 2003) such as communication between traditionally culturally separate healthcare professions (Hall, 2005). Communication however is not just impacted upon by a collaborative or interprofessional teamwork structure. Communication is also susceptible to personal differences between healthcare practitioners (Atkinson and Gregory, 2008).

Effective communication is dependent upon the personality of the individual and each individual situation (Leonard et al., 2004). This is evident in the findings in this study when one of the participants revealed:

RR 3: It depends a bit on the...referrer and their rapport with the radiographer, some will ask our opinions, others...just sort of...or they look for other...doctors around the hospital to discuss it with.

The social construction of a radiographic interpretation between a radiographer and a referrer is the product of an understanding relationship and actions that are shaped by knowledge and experience (Brown, 1995). It is through interactions between radiographers and referrers within the practice and social world of the radiographers, that knowledge is constructed (Burr, 2003). Rural radiographers gather the knowledge of their professional colleagues through their day to day interactions where getting to know the colleague is not the objective of the interaction but is an incidental side effect (Eraut, 2000). The interwoven nature of rural relationships means that rural radiographers may have explicit knowledge of their professional colleagues, but this does not replace the tacit knowledge which is instantly available to enable radiographers to respond to people who they know (Eraut, 2000). Rural radiographers do not always know their referrer colleagues and their decision making in regard to radiographic interpretation relies on informally acquired and sometimes tacit knowledge. Without a pre-existing relationship, communication difficulties may exist because it is through interactions that '...shared versions of knowledge are constructed...' (Burr, 2003, p. 4) and in such cases radiographers are reverting to language games. While straightforward communication may provide the most effective means for communication with a referrer, straightforward communication it is not always possible, leaving rural

radiographers to determine what component of the radiographer/referrer game they are required to play as they attempt to do what is best for the patient.

The previous section has provided a theoretical understanding of rural radiographers' communication with referrers. While the radiographer/referrer game provided a framework for understanding radiographers' actions with referrers, it does not provide a way to understand why they are undertaking these actions and this is explored in the following section.

Ethics and perception of diagnostic duty

Just as ethics has provided a lens for understanding radiographers' actions and interactions with patients it also provides a lens for understanding radiographers' interactions with referrers. The answer to why radiographers become involved in conveying their radiographic opinion might lie in RR 9's *I feel it is my duty*. Duty is a 'moral or legal obligation' (Moore, 2005, p. 366) but radiographers have no legal diagnostic duty to their patients (Smith, 2006b). Furthermore the healthcare professional's obligation is to provide services for which they have been trained (Mitchell et al., 1996) and it is known from the literature that very few radiographers have been specifically trained in image interpretation (Smith et al., 2009b). As healthcare professionals, radiographers are moving beyond their technical expertise (Hall and Davis, 1999). Radiographers operating at an expanded scope of practice may be expected to exhibit a higher duty of care (Freckelton, 2012) however radiographers are not medically trained and therefore should not be required to be medico-legally responsible for the diagnosis that results from their communication of their radiographic opinion this should continue to rest with the referring clinician (Smith and Younger, 2002; Freckelton, 2012). In Australia it has been reported that legal consensus appears to be that the standard of care '...to be expected of an ordinary and competent practitioner of the class to which the [defendant doctor] belongs' (Dix et al, 1988 cited in Mitchell et al, 1996, p. 83). A radiographer should therefore not be expected to perform to the same standard as a radiologist. A healthcare professional need not exhibit the highest skill set they should only be expected to exercise the '...ordinary skill level of an ordinary competent...' healthcare professional working within that particular

branch of their profession (Mitchell et al 1996, p. 82-83). It appears that radiographers' do not have a legal obligation to operate beyond the skill set of an ordinary competent radiographer and yet this study has shown that radiographers strive to ensure that a referring clinician is in a position to use an accurate radiographic interpretation on which to base the diagnosis for their patient.

Social structure and cultural values influence the character of care provided by health care providers (Leininger, 1979). Consequently, rural radiographers interpret their role as a healthcare professional to include a moral obligation to their patient that includes a diagnostic obligation. As they stand in the diagnostic gap where patient advocacy is an integral component of radiographic practice (Lam et al., 2004), rural radiographers become a vital interface between a patient and other members of the medical profession (Peters, 1996). For rural radiographers, the clinical judgement they apply is based upon implicit and tacit knowledge and requires an understanding of what could facilitate a good outcome for the patient. A good outcome for the patient includes helping patients during times when they are vulnerable and/or distressed, and involves reflection on beneficence and non-maleficence (Benner et al., 1999; Johnstone, 2009). Therefore it is beneficence and non-maleficence that direct radiographers to ensure a referrer becomes aware of a radiographic abnormality, and also to avoid discussions of bad news on the grounds that disclosure of the truth will cause distress to the patient (Rosner et al., 2000). There is further evidence to support radiographers avoiding disclosure of a life alerting diagnosis because they are not in a position to provide information about treatment at the time of the disclosure as it has been revealed that 'information about treatment relieves the diagnostic burden' (Salander, 2002, p. 728).

Clearly there is a significant ethical component to rural radiographers' involvement in radiographic interpretation, communication and disclosure. The consequences to the patient of ongoing functional disability, distress or perhaps even death as the result of misinterpretation of a radiographic image, due to either error of perception or error of interpretation was discussed at length in chapter 2. Rural radiographers' concerns associated with missed or delayed radiographic interpretation were also evident in the findings. Where a radiographer intervenes to ensure that the referrer is in a position to act upon an accurate radiographic interpretation and harm to the patient is avoided, then this could be understood under the principles of non-

maleficence, beneficence and justice of a patient achieving an accurate diagnosis (Beauchamp and Childress, 2001). Radiographer's radiographic opinion that they disclose to patients may be understood under the principle and rules which encompasses veracity, non-maleficence, beneficence and autonomy (Beauchamp and Childress, 2001; Tuckett, 2004).

The problem with applying the four principle approach provided by Beauchamp and Childress to rural radiographers' decision making, is that this framework for moral reasoning does not offer definite answers to a moral problem (Beauchamp and Childress, 2001). The four principle framework may be applied to produce any preferred answer (Holm, 1995; McCarthy, 2003) because '[no] moral philosopher has ever been able to present a system of moral rules free of these kinds of conflicts between principles and exceptions to principles' (Beauchamp and McCullough, 1984, p. 16). This issue really only requires consideration when two principles conflict (Berglund, 2004). A conflict of principles may be referred to as a moral or ethical dilemma. An ethical dilemma is a situation that involves questions of morality (Mundy 1999, p.104), or conflicts between personal values and professional responsibility (Turner 1996, p. 271) which may be evident in rural radiography.

Ethical dilemmas may arise as a consequence of the pervasive issue of familiarity and interwoven relationships within rural communities (Cook, Hoas & Joyner 2000; Cook, Hoas & Joyner 2001; Glover 2001; Warner et al. 2005; Turner, Marquis & Burman 1996; Roberts, Battalia & Epstein 1999). Dilemmas for rural radiographers are demonstrated in the findings where in some instances rural radiographers increase their level of disclosure to a patient but in other instance decrease their level of disclosure as a result of a pre-existing relationship with that patient. The difficulty that arises with a moral dilemma which results in a conflict between principles is that the four principle approach '...stipulates that none of the principles is *a priori* privileged' (McCarthy, 2003, p. 66). Communication by rural radiographers is complex because there is no one model for communication that will fit all situations (Costello, 2004). For any situation each principle must be examined in context (Holm, 1995, McCarthy, 2003) because one principle does not automatically over-ride another principle. While non-maleficence is the duty to avoid harm to others, beneficence is the obligation to do good (Lynn 1999, p.259). Accordingly, there exists

an obligation not to inflict harm and to contribute to their wellbeing. But it should be noted that ‘...principles of beneficence potentially demand more than the principle of non-maleficence because agents must take positive steps to help others, not merely refrain from harmful acts’ (Beauchamp & Childress 2001, p. 165). Examination of an ethical decision under the rule of veracity might guide a radiographer to tell the truth, but non-maleficence might guide the radiographer to avoid relating the brutal truth as it might cause harm. The answer to a moral dilemma is found by weighing the values involved, justification of the decision and critical review (Glover 2001, p.335).

Beauchamp and Childress (2001, p.18) describe the process of decision making as balancing, where a metaphor of larger and smaller weights moving up or down a scale is employed to graphically depict the processes. Discussion that may be coloured by this debate shows that such decisions are dynamic and that the same level of balance may not always prove possible (Berghlund, 2004). This may be explained by the implicit nature of ethical decision making (Eraut, 1985).

While ethics has provided a framework for understanding radiographers’ actions, the principles of autonomy, beneficence, non-maleficence and justice are simply tools for understanding radiographers’ behaviour. The radiographers did not use the language of the four principle approach of Beauchamp and Childress to describe their actions; rather they used language such as *best for patient, duty, responsibility* and *I try not to give them something that they’re going to go home and worry about*. The radiographers have not used the language of ethics. Similarly, in a small pilot study of Australian radiographers, Lewis (2002, p.155) found that some of the radiographers who were interviewed had difficulty with the comprehension of some ethical concepts and terminology. Radiographers’ lack of use of the language of ethics identified in this study must be placed in context. Medical ethics is now a component of every undergraduate radiography course taught in Australia (Lewis, 2003); however, none of the radiographers interviewed had a degree in radiography, as they all qualified before the transition in radiography education from hospital based training to university based degree that was completed in 1992 (Lewis, 2003) and 1993 in Tasmania. The curriculum for the field of radiography has not remained static (Liang et al., 2010). The rural radiographer participants’ training, which provided the foundation for the pre-university based radiographic qualification, was based on a radiographic syllabus that was constructed to support the attainment of a body of knowledge for the purpose of

achieving a successful radiographic examination (Hammick, 1995). Even knowing moral principles may not be sufficient for recognising when the application of a moral principle might be appropriate (Benner et al., 1999). So while radiographers are not using the language of ethics, it has been demonstrated that they are operating within an ethical framework. The radiographers are not basing their decisions on a hierarchy of defined values, but have constructed an approach to ethics where their values guide their decisions and their decisions guide their values. Telling the truth is contextual and so exists in ‘...the reality of lived experience...’ not as a practice isolated from context (Tuckett, 2006, p. 179). Rural radiographers’ decision making may be explained as a moral intuition where ‘...moral intuition is an immediate apprehension of the mind...about what is right to do in a particular situation’ (Shaw, 2001, p. 16). This demonstrates the implicit nature of rural radiographers’ ethical assumptions which are embedded within personal habits and professional traditions (Eraut, 1985).

Radiographers’ decisions are contextual and experiential and do not appear to be based on negotiations between the principles. Rather their decisions appear to be based on responsibility and care within their personal and professional relationships (Lutzen, 1997). Patient care in radiography is recognised in the field literature (Bowman, 1993; Murphy, 2001; Lam et al., 2004; Towsley-Cook and Young, 2007). Descriptions of patient care in the radiography literature, however are directed at obtaining patient trust (Murphy, 2001) and compliance for radiographic image acquisition (Bowman, 1993; Murphy, 2001; Towsley-Cook and Young, 2007). While others have recognised that patient care may be increased by the expansion of the traditional role of the radiographer (Lam et al., 2004), this study has identified that rural radiographers’ construct of their role in patient care extends beyond image acquisition into radiographic image reading, communication and disclosure of their radiographic opinion. Culture and cultural values influence the nature and manifestation of care exhibited by rural radiographers (Leininger, 1979). While culture influences caring, it is also grounded in perception and subsequent judgement of the requirements of the patient (Griffin, 1983). It is rural radiographers’ perception of their diagnostic responsibility within their construct of patient care that motivates radiographers to do good for their patients which is consistent with an ethic of care (Tuckett, 1998).

Ethics of Care

Caring needs to be considered within the practice world of the rural radiographer because it is the caring relationship between radiographer and patient that is central to rural radiographers. Indeed a cornerstone to healthcare is accepting the responsibility of caring for someone (Berglund, 2004). It is essential that radiographers are caring professionals, because to operate within medical imaging without values, caring and ethics, is to operate without ‘foundation and force’ (Towsley-Cook and Young, 2007, p. 59). Caring may be defined as ‘... to be troubled; to be affected emotionally...to be concerned...have thought or regard’ (Moore, 2005). Caring is a much more complex concept than may be intimated by the definition above. Ethics of care¹³⁶ has its focus on relationships, care and compassion (Preston, 2001, p. 57). Caring is a fundamental element of the philosophy of human nature and in personal relationships (Griffin, 1983) with caring being socially embedded (Benner et al., 1996b). Caring is not transmitted genetically but is transmitted through the shared experience of clinical practice (Watson, 1979). Caring is therefore socially constructed (Finch, 2008). The socially constructed nature of caring is evident because knowledge of caring requires community and relationships where the knowledge is shared through dialogue (Benner et al., 1996b). It is the working environment of the rural radiographer that provides a place where radiographers interact with each other and also with and within their environment to construct frameworks of meaning (White, 2004).

Caring for patients is more than good intentions: it requires knowledge. The experiential knowledge that rural radiographers acquire through their actions and interactions with their radiographic colleagues which supports learning, may be considered knowledge shared for the common good within a caring community (Benner et al., 1996b). Caring, however brings together all of a rural radiographer’s knowledge because caring combines art, science and technology (Raholm, 2003). When radiographers care for patients by providing them with radiographic examinations, they become a part of that patient’s life (Griffin, 1983). As rural healthcare professionals, rural radiographers may already be part of that patient’s life, and duplicity of

¹³⁶ While the feminist perspective on ethics has resulted in the emergence of ethics of care (Preston, N. 2001), an ethic of care is not gender specific, as males may also adopt these ethical characteristics with “...the variable ...being social formation and role” *ibid.* rather than explicitly gender.

relationships may exist. Radiographers' caring results in a positive outcome for the patient. It is this responsibility of caring that, according to Berglund, may be considered as an obligation to do good which is beneficence (Berglund, 2004). Caring is '...specific and relational' (Benner and Wrubel, 1989, p. 3). Caring knowledge is knowledge that requires the identification of conspicuous situations and assessing when and then how to act (Benner et al., 1996b). Rural radiographers' construct of their role in patient care is based upon a value system that in turns affects their encounters with patients and referrers. Whether rural radiographers are conscious of it or not, their values affect their caring behaviour (Watson, 1979). The ethic of care constitutes an ethical approach whereby the needs of others is an important contribution to the ethical decision making (Raholm, 2003). Rural radiographers' values are at the core of their behaviour and are expressed in the decisions that they make and the actions that they undertake (Rassin, 2008). Radiographers' conviction of what is right with regard to patient care motivates their social and professional behaviour (Rassin, 2008). Rural radiographers develop a level of ethical expertise. To exhibit ethical mastery requires that radiographers must respond not only with ethical expertise, but must also recognise satisfaction or regret as the result of their action (Dreyfus et al., 1996). Ethical expertise by the rural radiographer participants in this study, indicated by expressing regret as a result of an action, is exemplified in the following excerpt:

RR 1: ... I mean this particular patient with the red dot and the tibial plateau fracture that was missed for 6 weeks... his knee is stuffed... I mean I am annoyed with myself that I didn't mention that he had the crack there now because I now I would have...and he came back and he had all sorts of trouble and then they couldn't do anything in the end.

Sensitivity in the delivery of interpersonal communication is one of the critical components for the delivery of care (Watson, 1979) and further reveals rural radiographers' ethical expertise. For example, a part of a caring role is to avoid brutal truthfulness but rather to 'drip feed' the truth as this allows the healthcare professional to take into account the welfare of the patient (Costello, 2004). Furthermore, providing a patient with small amounts of the truth is morally consistent with both patient welfare and patient autonomy (Costello, 2004). In lectures by John Gregory, a medical professor, published in 1770, he states that the most obvious of the moral qualities required by a physician is humanity (Gregory, 1770). Gregory goes on to further

describe humanity as ‘...that sensibility of heart which makes us feel for the distress of our fellow creatures, and which of consequence incites us in the most powerful manner to relieve them. Sympathy produces an anxious attention to a thousand little circumstances that may tend to relieve the patient...hence the unspeakable advantages of having a physician for a friend’ (Gregory, 1770, p. 18). Sympathising with a patient does not equate to feeling sorry for a patient, rather it results in a constructive response that allows radiographers to provide quality patient care (Towsley-Cook and Young, 2007). It appears that rural radiographers share Gregory’s perspective on care for the patient as they are incited to step beyond the technical into the humanistic side of rural radiography where they manipulate circumstance to ensure optimum patient care. Rural radiographers are therefore striving to fulfil their perceived diagnostic duty within an ethic of care, to their patients who may also be their friends. The difficulty that is evident for rural radiographers is that in order to fulfil this obligation they are utilising a skill that has largely been acquired experientially and that they themselves have admitted may be limited¹³⁷.

Summary

This chapter has explored the strategies that radiographers have adopted around communication and disclosure of their radiographic opinion and offered a theoretical perspective for understanding these aspects of rural radiographic practice. Rural radiographers navigate a complex interplay of variables as they decide the way in which to convey their radiographic opinion to referrers and patients. Radiographers’ communication of their radiographic opinion with referrers is mediated by the radiographer/referrer game and tends to diagnostic accuracy. Rural radiographers’ disclosure to patients however, is often diagnostically vague and may be understood as filtered truth. The way in which rural radiographers convey their radiographic opinion is contextual and informed by experiential knowledge that has evolved through their shared experience of clinical practice in rural settings. This knowledge contributes as equally to an effective outcome for the patient to a radiographic examination as the radiographer’s technical expertise in image acquisition.

¹³⁷ Radiographers’ not always being confident in their radiographic interpretation is discussed in Chapter 5 from page 200.

Rural radiography's evolution within a biomedical framework and a lack of formal training in ethics does not infer a lack of ethics. Rural radiographers exhibit a level of ethical mastery. They utilise skilful ethical behaviour in order to protect those who are vulnerable within their complex clinical environment, the patients. The rural radiographers appear to share a common ethical framework because moral beliefs may be transmitted implicitly within customs and practices of rural radiography, so that as a common social context, radiographers operating within the rural environment possess a common ethical framework. In relating their experience and understanding of communication and disclosure, rural radiographers did not use the language of ethics. Rather the common denominator to rural radiographers' conveyance of their radiographic opinion, actions and reactions is what is *best for the patient* which can be understood within the framework of the ethics of care. Rural radiographers' construct of their role in patient care is informed by an ethic of care.

Chapter 8: Conclusion

Introduction

The purpose of this chapter is to conclude the thesis. A summary of the thesis is provided along with a discussion of how the research questions have been answered and the research aims were met. The significant contributions and limitations of the research are outlined, and suggestions for future research and recommendations are also provided. This chapter ends with a concluding statement.

Summary of the thesis

This study has presented a unique insight into the complex and humanistic dimensions of the practice world of the rural radiographer. The literature review undertaken for this study demonstrated that very little was known about topics of central interest to the thesis: radiographic interpretation by Australian rural radiographers, communication of their radiographic opinion to referrers and disclosure of their radiographic opinion to patients. Furthermore, there existed no comprehensive theoretical understanding or evidence of the implications on practice of rural radiographer interpretation, communication and disclosure and the subsequent implications for health service management. This was of concern as the field literature further revealed that quality patient care in rural radiography relies on rural radiographers achieving a sound command of interpretation and communication.

In order to unearth rural radiographers' experience, interpretation and understanding of radiographic interpretation, communication and disclosure and to address the gaps in the literature, a two phase exploratory interpretive study was undertaken. Data was collected between August 2007 and May 2010 from cohorts of radiographers working in rural Australia using a paper based questionnaire followed by a series of in depth semi-structured interviews. The purpose of the questionnaire, which had both quantitative and qualitative components, was to build on the findings from the literature review and to provide the initial lines of inquiry for the interview stage of the study. The questionnaire also fulfilled the purpose of providing a demographic profile

of rural radiographers as there is little current data on the rural allied health workforce of which radiographers form part (Keane et al., 2008; KPMG, 2009; Scott and Cheng, 2010). The questionnaire data confirmed that not only are radiographers participating in radiographic interpretation, but further revealed that this does lead to them conveying their radiographic opinion to both referrers and patients. The questionnaire further showed that disclosure to patients is not straightforward but rather that it is embroiled in difficulty. The findings from the questionnaire demonstrated that the participant rural radiographers were making decisions around disclosure to patients on radiographic diagnosis in a climate where there was no consensus on whether they should disclose or on their medico-legal standing with regard to disclosure. While the questionnaire provided evidence to support radiographers' involvement in radiographic interpretation, communication and disclosure, it did not reveal how radiographers were communicating and disclosing. Answers to the interplay between radiographers and referrers and patients in conveying their radiographic opinion were sought through in depth semi-structured interviews with nine rural radiographers. The resultant interview transcripts were analysed using thematic analysis which allowed for the identification, analysis and reporting of patterns that arose from the data (Braun and Clarke, 2006). Six key themes were identified across the data. Thematic analysis of the interview data revealed that, due to the lack of clarity around where they stand medico-legally, rural radiographers draw upon experientially acquired radiographic perception and interpretation knowledge as the basis for the complex multifactorial decisions they make about communication and disclosure. The context that shapes the rural radiographers' involvement in radiographic interpretation, communication and disclosure is the diagnostic gap. It is in their attempts to close the diagnostic gap that radiographers employ their experientially acquired knowledge of interpretation and communication. This has resulted in rural radiographers adopting a number of strategies for communication and disclosure that include language games and filtered truth.

The strategies that radiographers have adopted were theorised in order to provide some understanding of this aspect of rural radiography. This study combined social constructionist, socialisation and ethical theories into a theoretical framework to allow the complexity of rural radiographic practice to be captured and examined. This framework revealed that radiographers have not merely decided upon an appropriate course of action, but that context and complex actions and interactions have led

radiographers to adopt certain communication and disclosure strategies. It is the patient focus that has resulted in rural radiographers' construct of their professional role extending beyond image acquisition and into the contested ground of radiographic interpretation and conveyance of their radiographic opinion. Rural radiographer intervention in radiographic interpretation ensures that the referrer is in a position to act upon an accurate radiographic interpretation thus avoiding harm to the patient.

Radiography, as a profession, has emerged within a biomedical framework, and despite the identified positive impact of collaborative practice between rural radiographers and referrers, rural radiographers in their communications with referrers are playing the rural radiographic equivalent of the doctor-nurse game, the radiographer/referrer game. Rural radiographers operate within an environment where patient welfare is seen as central. Radiographic opinions that they convey to referrers may be understood under the bioethical principles of non-maleficence, beneficence and justice of a patient achieving an accurate diagnosis. Similarly radiographers' radiographic opinion that they convey to their patients may be understood as non-maleficence and beneficence; however, in disclosure to their patients, rural radiographers have constructed an ethical framework for decision making framed around telling the truth which also encompasses veracity, and autonomy. The rural radiographers in this study did not use the language of ethics to describe their decision making. The common denominator to rural radiographers' radiographic opinions, actions and reactions is the centrality of the patient to rural radiographic practice. Radiographers' sense of professional and diagnostic responsibility drives them to do what is best for the patient which can be understood within the framework of the ethics of care. Guided by an ethic of care, rural radiographers navigate a complex interplay of variables as they decide the way in which to convey their radiographic opinion.

Achieving the research aims

The overarching aim of this study was to contribute to the field knowledge informing professionals, educational and policy decisions relating to radiographers' scope of practice. This has been achieved by addressing the four contributing aims each of which is addressed in the following section.

This study has provided a substantive theoretical insight into the practice world of rural radiographers and their experience of communication and disclosure of their radiographic opinion. This insight has been achieved through examining the meanings that emerge from this study of rural radiographic practices that are socially, culturally and historically mediated by the rural context using ethical theories. Complex ethical and social dimensions exist in rural radiographers' practice and their exploration has opened a window into rural radiographic practice. This window has rendered aspects of the practice world of the rural radiographer visible to people with little or no experience of rural radiography. Using a social constructionist lens the study uncovered the social, cultural and historical influences upon which rural radiographers construct their practice world, particularly the way in which rural radiographers experience, interpret and understand radiographic interpretation, communication and disclosure of their radiographic opinion. It has been demonstrated that it is the interactions amongst radiographers and between radiographers and radiologists that have generated radiographers' knowledge for radiographic interpretation (Burr, 2003) and it is a social constructionist tenet that knowledge is not just shared in an interaction, but it is created in an interaction (Whiting, 2007). The meaning resulting from these interactions is not just an application of the meaning derived from the interaction, but is developed from each individual's process of interpretation (Blumer, 1969). Radiographers, referrers and patients are not reacting to their environment but their actions are guided by their interpretations of each situation (Polgar and Thomas, 1998). Rural radiographers' interpretation and consequential construction of their practice world, has resulted in their adoption of communication and disclosure strategies in order to address their perceived professional and ethical obligations to their patients. The radiographer/referrer game has been introduced as a way of understanding rural radiographers' communication strategies with referrers and rural radiographers' disclosure to their patients may be understood as filtered truth. It is rural radiographers' construct of their role in patient care that is informed by an ethic of care which is the commonality to the means by which they convey their radiographic opinion.

The social nature of rural radiography and the way that radiographers have created meaning determines the way in which they behave, so that meaning becomes visible through behaviour. This behaviour has been captured through radiographers'

accounts which were recorded and transcribed into text so that the transcripts became text for analysis (Geertz, 1973). The accounts by rural radiographers have made rural radiographic practice visible by exploring the meaning that radiographers socially construct about rural radiographic practice. These accounts have also provided the radiographers' voice which is evident throughout this study: this has been achieved by incorporating throughout the body of the thesis radiographers' voices captured as verbatim extracts of text from the data. In these extracts it can be seen that radiographers have spoken little about the technical aspects of rural radiographic practice, but rather spoke of the patient focussed nature of rural radiographic practice.

The ways in which rural radiographers understand their responsibilities related to radiographic interpretation, communication and disclosure were captured through the questionnaire and in-depth semi-structured interviews. These are data collection techniques that were well suited to the constructionist framework as they allowed the researcher to provide rich descriptions as the meanings and experiences of rural radiographers were revealed (Williamson, 2006). From the data collected, patterns of similarity were identified specific to radiographic interpretation, communication and disclosure within the rural radiographic context. The analysis of the patterns was used to extend the descriptions of rural radiographic practice to become more inclusive of how rural radiographers experience, interpret and understand radiographic interpretation, communication of their radiographic opinion with referrers and disclosure of their radiographic opinion to patients. The study has allowed insight into poorly understood areas of rural radiographic practice and demonstrated that radiographers' understanding of their responsibilities relating to the interpretation of radiographic images is driven by their sense of professional and diagnostic duty which is in turn responsible for the ethical framework that they have constructed.

The social constructionist framework employed in this study allowed an exploration of how communication and disclosure are managed in day to day practice by rural radiographers and how this impacts on contemporary rural radiographic practice. The way in which radiographers respond when faced with the issues surrounding radiographic interpretation, communication and disclosure is culturally, socially and historically informed. Rural radiographers' understanding of their professional and diagnostic duty to their patient has resulted in rural radiographers moving from their

documented area of practice (radiographic image acquisition) into the contested ground of radiographic interpretation in order to ensure optimum patient care. Rural radiographic practice has therefore come to incorporate a significant component of radiographic interpretation, communication and disclosure.

Answering the guiding questions

A series of guiding questions were used in order to address the aims of this study. Summaries of how each of the guiding questions has been answered are provided in the following the answers to each of the guiding questions are outlined in the following.

1. How do rural radiographers develop radiographic interpretation skills?

This study has demonstrated that rural radiographers' skills in radiographic interpretation have generally been acquired through informal pathways. Indeed 96% (n =58/60) of the radiographers who responded to the questionnaire revealed that they did not have any formal qualification in radiographic interpretation. Those who indicated that they held formal qualifications in radiographic interpretation revealed that these qualifications were acquired as part of their medical imaging degree. The majority of the rural radiographers therefore, had acquired their radiographic interpretation knowledge informally through explicit and/or implicit pathways. The radiographers revealed the pathway for the acquisition of explicit and implicit knowledge of radiographic interpretation was through informal routes between experts such as radiologists and experienced rural radiographers and themselves as less experienced radiographers. This demonstrates that rural radiographers' radiographic interpretation skills are based on practical and experientially acquired knowledge.

2. What do rural radiographers consider to be the issues with communication with referrers and disclosure of their radiographic opinion?

The rural radiographers revealed that there are several issues with communication with referrers and disclosure of their radiographic opinion to their patients. This study demonstrated that, despite the often collegial and collaborative nature of rural healthcare, communication between radiographers and referrers is impacted upon by the

biomedical framework in which radiography evolved and the implicit nature of radiographers' interpretation skills. The consequence of radiography's evolution within the biomedical framework and the implicit origins of radiographers' interpretation skills is that referrers may ignore radiographers' identification of a radiographic abnormality and their attempts to communicate their radiographic opinion. Furthermore rural radiographers are involved in an area of practice for which they are rarely formally qualified and for which they receive little or no guidance. As a consequence of the lack of formal qualifications, rural radiographers are not always confident in their radiographic interpretation and are therefore sometimes reluctant to communicate their identification of a radiographic abnormality because they are unsure of its radiographic interpretation.

The often informal pathway for the acquisition of radiographic interpretation knowledge also presents as an issue for rural radiographers' disclosure to their patients. Rural radiographers are sometimes reluctant to rely on their informally acquired radiographic interpretation skills for the construction of their radiographic opinion. In addition to the difficulties associated with reliance on their radiographic interpretation skills, rural radiographers also identified other issues that impact on their disclosure to their patients.

Radiographers indicated that their replies to their patients' questions are tempered by the ambiguity of the legal standing of radiographers with regard to disclosure of diagnostic information to patients. Legislative limitations regarding radiographers' disclosure are unclear and as a result rural radiographers are unsure of what information they should disclose to patients (Lewis, 2002). Disclosure by rural radiographers is further complicated because they are also making an assessment of their patient that includes their personal relationship with the patient and the radiographer's judgement of how well they believe a patient will cope with the information to be disclosed. Radiographers' perceptions of the significance of an identified radiographic abnormality also contribute to the decisions that radiographers make around limiting their replies to patients. The more significant rural radiographers perceive the abnormality to be, the more they are inclined to filter the truth and consequently the less they disclose to their patients. In addition, radiographers may avoid a frank disclosure to their patients on the grounds that it may cause the patient

anguish or distress. The radiographers' responses to patients' questions regarding diagnostic information seem to be worded in such a way as to not give a patient reason for undue concern about their imminent diagnosis.

3. What strategies do rural radiographers employ to address these issues and why?

Rural radiographers employ a number of strategies in order to circumvent the issues around communication with referrers and disclosure of their radiographic opinion to their patients. The strategies that radiographers employ with referring clinicians are impacted upon not only by the professional relationship between radiographer and referrer but also upon the radiographer's assessment of the diagnostic gap and the impact that the diagnostic gap may have on patient care. Where a collegial relationship exists between a referrer and a radiographer, this leads to open and frank discussions around an identified radiographic abnormality and radiographic interpretation. Although informally involved in the decision making process, radiographers are actively involved in the construction of the radiographic opinion with referrers. In these cases the radiographer does not defer to the referrer and may even be the one to instigate the discussion by contacting the referring clinician.

In cases where the radiographer considers that the diagnostic gap may impact on patient care and they are unsure of their professional standing with their medical colleagues, rural radiographers resort to language games in their communications with referrers. Where radiographers and referrers do not have a collegial or pre-existing collaborative relationship, radiographers tend to adopt a subordinate role; in this communication strategy radiographers avoid confrontation with the referrer by hinting their radiographic opinion, the radiographic equivalent of Porter's informal covert decision making. The radiographers provide clues throughout their discussions with the referrer in order to lead the referrer through perception so that the radiographer attempts to construct an accurate radiographic interpretation with the referrer.

The strategies that rural radiographers employ in disclosure of their radiographic opinion to patients are also multifactorial. Without formal procedures and protocols for rural radiographers to follow in order to decide how to reply to a patient's request for diagnostic information, rural radiographers are using what they consider to be the issues

with their disclosure to patients to guide the strategy that they employ under an ethical framework of ethics of care. Consequently, on the basis of this ethical framework, rural radiographers construct a radiographic opinion for disclosure with their patient as they respond to the patient's requests for diagnostic information. In cases where the radiographers perceive no impediment to a full disclosure, then rural radiographers will construct a reply for the patient that details the extent of the identified radiographic abnormality. However as the rural radiographers perceive that the issues with disclosure begin to impact on an appropriate level of disclosure, then they begin to construct replies that are filtered truth. As the perceived impact of the issues increases, radiographers move from the use of language to minimise disclosure through to language to avoid disclosure in an attempt to avoid harm to the patient.

4. What beliefs and values guide rural radiographers' decisions and behaviours around communication and disclosure of their radiographic opinion?

Rural radiographers' decisions and behaviours around disclosure are guided by the centrality of the patient to rural radiographic practice. This study revealed that, despite having no legal diagnostic duty to their patient and no obligation to provide their radiographic interpretation (Smith, 2006b), rural radiographers appear to have a belief in their diagnostic duty. Rural radiographers apply their clinical judgement based on the technical and the practical, the explicit, implicit and tacit knowledge of rural radiographic practice in order to determine how best to facilitate a good outcome for their patient. The values that appear to guide radiographers' decisions and behaviour may be understood under the bioethical principles of autonomy, beneficence, non-maleficence and justice, and the moral rule of veracity. Rural radiographers, however, do not use the language of bioethics nor do they appear to be using a hierarchy of defined values and making decisions based on negotiation between bioethical principles. Rural radiographers' decision making may be best understood as an ethics of care.

5. Who are rural radiographers and how are they defined?

Rural radiographers for the purpose of this study were defined as healthcare professionals holding a SoA from the AIR and providing radiographic services to a

community with a population of less than 100,000. As a result of the difficulties that arose within this study for identifying rural radiographers, a definition of rural radiographers was decided upon prior to data collection. As discussed in chapter 1, providing radiographic services to a rural community and holding a radiographic qualification would not necessarily identify rural radiographers as radiographers are not the only ones undertaking radiography in rural areas. In some rural healthcare facilities where the workload does not warrant employment of a full time radiographer, radiographic duties already fall to remote operators. Furthermore the evolution of radiographic education has resulted in various levels of qualification and names for those qualifications that a radiographer may hold. The only commonality for radiographers ~~to~~ working in Australia that could be identified at the commencement of the study was the Statement of Accreditation (SoA). Changes in the registration requirements for Western Australian radiographers resulted in alteration to the eligibility criteria for the Western Australian rural radiographers participating in the study to having registration with the Medical Radiation Technologists Registration Board of Western Australia (MRTRBWA) or a Statement of Accreditation.

6. What is the profile of healthcare professionals providing radiographic services to rural Australia?

A profile of rural radiographers was captured through the questionnaire and the initial questions posed to the interview participants. The profile of the rural radiographer and rural radiography revealed demographic data such as age, gender, qualifications, training, and current employment and these are reported in detail in chapter 4 and as the Appendix F. The profile of the rural radiographers in this study revealed that they ranged in age from 21 to 61 years of age and held radiographic qualifications that ranged from a certificate to a degree. Half of the radiographers held a postgraduate qualification, half of which was an ultrasound qualification. They had been a radiographer for between one and forty-one years and over two thirds of the radiographers were female. The radiographers commonly work fulltime ($n = 42/60$; 70%) in public practice ($n = 40/60$; 66.7%). The data revealed that rural radiographers fit within a wide demographic profile. The profile did not appear to demonstrate any outstanding feature of a rural radiographer and it may be, as Petros (1999) suggests, that rural radiographers do not greatly differ from their urban counterparts.

Answering the overarching research questions

Answering the guiding questions for this study has also provided answers for the overarching research questions. This is elaborated upon in the following section.

1. How do rural radiographers experience, interpret and understand radiographic interpretation, communication and disclosure of their radiographic opinion?

Rural radiographers' experience, interpretation and understanding of radiographic interpretation, communication and disclosure of their radiographic opinion is multifactorial and complex, and can be seen in the answers to guiding questions 2 and 4. Rural radiographers' involvement in radiographic interpretation, communication and disclosure presents them with a number of issues that have been outlined in the answer to question 2. It is as a consequence of these issues that radiographers have developed the communication and disclosure strategies identified in answer to guiding question 3. Despite the issues, and guided by their values and beliefs, rural radiographers nonetheless undertake radiographic interpretation, communication and disclosure. The ethical framework that radiographers have constructed for rural radiographic practice, interpretation, communication and disclosure has resulted from their interpretation of their professional duty and their belief in their diagnostic duty to the patient. This ethical framework has developed in order for radiographers to fulfil the guiding ethical principle of what is best for the patient.

2. How do rural radiographers construct ways to negotiate communication and disclosure of their radiographic opinion within their practice world?

The ways that radiographers have constructed to negotiate disclosure of their radiographic opinion within their practice world are provided in the answers to guiding question 3. In the answer to question 3, radiographers' involvement in the radiographer/referrer game for their communication with referrers and filtration of the truth for disclosure to patients were discussed. The rural context and the biomedical model in which radiography has evolved influence the way that radiographers construct their radiographic opinion with referrers. The centrality of the patient and the ambiguity of the medico-legal standing of radiographers' disclosure to patients, impacts upon how

they construct a radiographic opinion with their patients. Again, the influence of the beliefs and values that guide radiographers' decisions and behaviours around communication and disclosure of their radiographic opinion is discussed in answer to guiding question 4 and demonstrates in particular their belief in the centrality of the patient and patient welfare to rural radiographic practice.

3. How might this inform the preparation of radiographers and other healthcare professionals who will be providing radiographic services for rural Australia in the future?

Radiographers and other healthcare professionals cannot be adequately prepared for the provision of radiographic services to rural Australia into the future without first understanding what services are currently provided and by whom. Guiding questions 5 and 6 revealed the profile of radiographers who are currently providing this service. The radiographers fit within a wide demographic profile and they ranged considerably in age and experience as a radiographer. As the answer to guiding question 1 revealed, radiographers' interpretation skills are experientially acquired. Experience was demonstrated to be the key factor to rural radiographers' involvement in radiographic interpretation which subsequently leads to communication and disclosure. The key to rural radiography is not that they may be 21 or 61, male or female, that they hold a Statement of Accreditation or that they provide radiographic services to a rural community. The key to rural radiography is the experientially acquired and cognitively complex radiographic interpretation and subsequent communication and disclosure skills that these healthcare professionals possess. It is these skills that are not visible and so the overriding impression of rural radiographers is as a technician. Preparation for rural radiographic practice needs to incorporate these skills so that radiographers can move seamlessly into rural radiographic practice and quality and safety can be assured.

Significant contributions

A key contribution for this study is that the methodology and findings present an alternative way of examining and understanding rural radiographic practice. Rather than the technical discourse that dominates the radiographic literature, rural radiographic practice is presented as a humanistic endeavour. The methodological approach used has

allowed this study to provide a substantive theoretical insight into the practice world of the rural radiographer and their experiences of radiographic interpretation, communication and disclosure of their radiographic opinion. Consequently this is one of the few studies considering radiographers understanding of their role in patient care and the centrality of the patient to radiography.

The rural radiographer voice has provided insight into rural radiographic practice and unearthed the complex ethical and social dimensions to rural radiographic practice. It is this insight that may provide a platform for informing rural radiographic workforce models required under current and future Australian healthcare workforce reform. Furthermore, as this appears to be the first major study into Australian rural radiographers' disclosure of their radiographic opinion to their patients, it may provide a platform for other researchers to build upon.

The findings from this study may be relied upon because it is a rigorous study presenting trustworthy findings. The research design employed two data collection techniques—a questionnaire followed by in depth semi-structured interviews. The questionnaire was an example of intra-method mixing as it combined both quantitative and qualitative components with both open and closed ended questions (Johnson and Turner, 2003). The advantage of the use of closed questions is that it allowed conversion of the respondents' answers into a numerical form in SPSS® which facilitated analysis and cross-tabulation for comparison of datasets and so provided a descriptive overview of rural radiographers. The framing of some questions to allow open ended free text responses permitted the respondents to formulate their own replies to the questions posed and so provided greater insight into the respondents' world (Polit and Beck, 2004, Seidman, 2006). Further insight into the participants' world was unearthed through the in depth semi-structured interviews which allowed the participants to provide rich descriptions of their experiences of rural radiographic practice. An iterative process was utilised in the in depth semi-structured interviews so that, as new areas of information were revealed, they were pursued within the interview and in subsequent interviews.

A strength of this study was the researcher's position as a practitioner/researcher which allowed the researcher to view the study from an emic perspective and allowed

for a subjective and informed standpoint (Kanuha, 2000) which potentially provided greater depth to the data with corresponding contextual detail (Hewitt-Taylor, 2002, p. 35). As a rural radiographer, the researcher already had an understanding of rural radiography (Smyth and Holian, 1999; Kanuha, 2000; Coghlan and Casey, 2001) which may have allowed insight that might not be so readily available to a non-radiographer (Breen, 2007). The researcher was also able to use the everyday and often unique language of her radiographic colleagues (Decker and Iphofen, 2005) within the interview process and follow up on their replies in order to obtain richer, deeper data (Coghlan and Casey, 2001). Consequently, the interview as an information sharing event built on the radiographer-radiographer relationship with the result being quality data leading to quality research (Gardner, 1996). The researcher's position as a rural radiographer and the flexibility of thematic analysis also potentially impacted upon data analysis by influencing what was seen and unseen with the qualitative data set (Breen, 2007) because a cultural insider may see within the data what a cultural outsider may fail to see (Boyatzis, 1998). The use of thematic analysis, while it allowed unanticipated insight (Braun and Clarke, 2006) as an inductive approach to data analysis, has meant that any identified themes are linked to the data itself (Patton, 2002, Braun and Clarke, 2006). The findings from this study therefore '...present faithful descriptions' (Koch, 1998, p. 1188) of the world of the rural radiographer.

Limitations

The data for this study was gathered during a time of unprecedented reform in healthcare that is beginning to invoke changes in the way in which healthcare workers are prepared for, and the way in which they work. This research took place between August 2007 and May 2010 and drew on small purposeful samples of participants from rural New South Wales, Tasmania and Western Australia, situating the study in both context and time. The results of this study therefore present a snapshot of rural radiography in that it is limited by both context and time. It is not possible to generalise the findings of the qualitative component of this study to the wider rural radiographic population because of the contextual nature of such research (Lincoln and Guba, 1985; Hansen, 2006). It has been suggested that the depth of understanding provided in qualitative research in cases of genuine saturation may provide theory that is applicable

more broadly (Minichiello et al., 1999). It should be noted that, in the literal sense, transferability is impossible in qualitative research because the results of qualitative research are infrequently generalisable (Hansen, 2006). This research, however, does not seek to provide some sort of universal truth of rural radiography but instead employs the interpretative approach in order to provide deeper understanding of specific aspects of rural radiography. In the words of Kenneth Gergen:

I think we gain most if we appreciate these analyses not as reports on objective truth, but as “frames” or “lenses” on our world – to shake us up, reconstruct, give further dimension, and open new vistas of action. There is always more to say – for which we should be thankful.
(Gergen, 1999, p. 86)

Recommendations

The recommendations presented in this section based on the study findings focus on the need to recognise radiography as a humanistic as well as a technical endeavour. The sophistication and complexity the humanistic perspective brings to the study means the radiographer’s role in radiographic interpretation, communication and disclosure must be reflected in contemporary professional frameworks and practices. These perspectives have been predominantly missing from rural radiographic research and literature; however they play a key role in informing healthcare models in the form of six key recommendations. While these recommendations may also have relevance to the urban setting further research specifically exploring urban based radiography would be required.

Recommendation 1

For radiographers there needs to be recognition that for rural radiographers, plain film general radiography is not solely a technical endeavour, but incorporates a significant humanistic dimension. Recognition of this is important because rural radiographers’ construct of their role in patient care motivates rural radiographers to contribute more to patient care than the provision of a high quality radiographic image. Only when these aspects of practice are made explicit can rural radiographers’ voices be captured and so play a role in advancing the profession and influencing the allocation of scarce resources.

Recommendation 2

For policy makers there needs to be acknowledgment of the complex humanistic dimensions of rural radiography and radiography as a specialised profession which provides more than high quality radiographic images. To consider plain film radiography as technical and not cognitively complex diminishes the specialised nature of the role of the radiographer with the risk of workforce substitution where pseudo-efficiency is substituted for quality healthcare. A concern with role substitution and advanced practice is that general plain radiography may be relegated to ‘...second class status...’ (Freckelton, 2012, p. 49). In such cases a patient may not only be the recipient of a lower quality radiographic image (Freckelton, 2012), but may also not have the benefit of a radiographer reading and perhaps triaging their radiographic image at the time of their presentation to the medical imaging department. This will potentially impact negatively on patient care and so radiographers require support to perform their complex technical and humanistic role in patient care.

Recommendation 3

For radiographers and referrers there needs to be cross-professional recognition and acceptance of the significant contribution that radiographers often make to a referrer’s formation of a diagnosis, by supplying their radiographic opinion. This recognition is central to high quality patient care because an accurate and timely radiographic interpretation can have significant diagnostic and therapeutic benefit for the patient.

Recommendation 4

Radiographers’ preparation for radiographic interpretation and communication of their radiographic opinion is currently ad hoc and this has resulted in radiographic interpretation and communication difficulties in interprofessional communication. While rural radiography’s social, cultural and historical background may have provided a basis for the construction of a pathway for communication with referrers; it is not without its limitations. Therefore the recommendation is for the formation of a nationally and cross-professionally accepted Radiographer Abnormality Detection Scheme which would allow effective communication and positively impact on patient care. Education and training for radiographers to participate in such a scheme would

require not just interpretation skills but also the communication skills required to convey their radiographic opinion.

If Australian radiographers under current reforms are to be situated to actively participate in a scheme such as the provision of an informed comment¹³⁸ that is commencing in the UK (Saunders, 2012), they will require education and support to be able to move beyond recognition and location of a radiographic abnormality to the provision of more diagnostically specific information.

Recommendation 5

Australian rural radiographers are operating with the perception of unclear legal and professional boundaries for disclosure of their radiographic opinion to their patients. The study findings indicate that there is a need for clarification of radiographers' legal position with regard to disclosure of their radiographic opinion to their patients and this clarification should be promulgated throughout the profession.

If, as the AHPRA standards for practitioner behaviour under the Medical Radiations Practice Board of Australia *Code of Conduct for registered health practitioner* suggest, radiographers should discuss the patient's condition with them, and no legislative impediments are identified in the Australian legislation (Medical Radiation Practice Board of Australia, 2012), then radiographers will require education and support to undertake this aspect of radiographic practice.

Recommendation 6

Finally, for radiographers, the development of a recognised and validated framework on which they can base their decisions around disclosure will help to address the ambiguity currently accompanying disclosure. This study has provided insight into rural radiographers' disclosure to their patients and the ethical framework that radiographers appear to be using to guide their disclosure to patients. It provides a starting point for the development of a decision making framework that can be incorporated into contemporary radiographic practice.

¹³⁸ Informed comment is described in greater detail in chapter 2

Concluding statement

Decisions around current health reform are being informed by inaccurate assumptions of radiographic practice. The technical discourse used to frame radiographic practice is not benign: it is having a significant impact on resource distribution for rural practice but also impacts on conception of role substitution. Reinforcement of the technical discourse further marginalises rural radiographic practice as a field potentially compromising quality and safety in patient care. It is this notion of quality and safety in patient care in rural radiographic practice that this thesis unravels. This study has provided crucial evidence around the complexity of the humanistic dimension of rural radiographic practice.

Rural radiographers' construct of their role is informed by a multiplicity of forces. History and the evolution of radiography within biomedicine have contributed to the construction of contemporary rural radiography; however social processes, interactions with others and the professional and institutional practices of the Australian healthcare system have produced radiographers' construct of their professional role. Rural radiographers' cultural and socially shaped interpretation of their practice means they do not interpret radiography as a solely technical endeavour, but rather they understand radiography as social and humanistic. Rural radiographers' construct of their role in patient care therefore extends beyond image acquisition into radiographic interpretation, communication and disclosure. Rural radiographers' construct of their role in patient care is fundamental to rural radiographic practice and integral to understanding the practice world of the rural radiographer.

Rural radiographer's construct of their professional role intrinsically links the technical with the humanistic, with the result that rural radiographers' construct of their professional role means rural radiography is cognitively complex with rural radiographers operating in an expanded scope of practice. Rural radiographers are routinely participating in radiographic interpretation, communication and disclosure. Radiographic image production, interpretation and communication therefore combine technical and humanistic aspects within the role of the rural radiographer. Radiographers' skills and decisions in radiographic interpretation, communication and disclosure are contextual and informed by a collective of experiential knowledge that

has evolved through their shared experience of clinical practice within the rural environment. Rural radiographers, with their informally acquired and often intuitive radiographic perception skills and utilising experientially acquired radiographic interpretation skills, are making a significant contribution to patient care. Except in cases where a Radiographers Abnormality Detection Scheme is in place, rural radiographers are contributing to patient care by assisting referrers through dilemmatic informal means. The significance of rural radiographers' input varies, but in some instances radiographers' communication to referrers has not only improved patient outcomes by preventing a further decline in the patients' presenting symptoms, but has potentially saved patient lives.

The guiding principle for rural radiographers' complex decision making frameworks for conveying their radiographic opinion to referrers and patients is the centrality of the patient and patient welfare to rural radiographic practice. Rural radiographers' perception of their diagnostic responsibility within their construct of their role in patient care motivates radiographers to take positive steps to benefit their patients which is consistent with an ethic of care (Tuckett, 1998). Rural radiographers playing the radiographer/referrer game to communicate their radiographic opinion to referrers and filtering the truth in disclosure to patients can be understood when considered in light of the integrity of patient care to rural radiographic practice.

To consider that the radiographic practices unearthed in this study might apply only to rural radiographic practice may be an artificial separation. The literature has demonstrated that radiographic practice is constructed and understood through artificial separations both rural/urban, and technical/humanistic. Even to consider image acquisition as separate from radiographic interpretation is, for rural radiographers, often an artificial separation. Although this study was centred around rural radiographers, it has been suggested that rural radiographers generally have the same professional skills and habits as their urban counterparts (Petros, 1999). The literature suggests that the definition of 'rural' is perceptual and so dependent upon who is defining the term (Huntley 1991; Rourke 1997). So it follows that application of one definition will not be true to all applications but will at best be a compromise. Rural may be defined as areas with small populations that are at a distance from metropolitan centres (Bourke

and Sheridan, 2008), however distance from a major centre in itself is not a reliable indicator of rurality (Wootton, 1996, Hays, 1999).

Furthermore the rural environment is not the exclusive domain of close and familial relationships. Healthcare professionals who work in metropolitan areas may also know their patients (Cook et al., 2000). This being the case, the activities described throughout this research in regard to radiographic interpretation, communication and disclosure may well also be exhibited by urban radiographers. Literature revealing the results of a questionnaire investigating New South Wales radiographers' participation in advanced practices revealed that 39.7% of the New South Wales radiographers surveyed were involved in RADS and 30.4% of the radiographers had taken part in informal verbal reporting (Hardy et al., 2010, p. 30). There is further support for this hypothesis regarding similar practices between rural and urban radiographers when, following a presentation on the preliminary findings of this study at a research symposium, an email was received by the researcher from an urban radiographer revealing that he had been under taking radiographic interpretation and unofficially passing results to patient for many years. Rural radiographic practice may therefore not be dissimilar to urban radiographic practice.

The link between radiographic interpretation and diagnosis has already been established in this thesis. Rural radiographers' input is often instrumental in referrers' formation of a diagnosis. In the complex environment of medical care (Leonard et al., 2004) in which the inherent perceptual errors of radiographic interpretation (Pitman and Hare, 2007) exist, it is imperative that communication channels are open so that individuals may speak out (Leonard et al., 2004). Both this study and the field literature have demonstrated medical hierarchy can effectively check individuals from speaking out and communication failures are a common cause of patient harm (Leonard et al., 2004). The benefits of collaborative radiographic interpretation and communication are that group decision making allows for one person to identify evidence that another has overlooked (Christensen, 2005). It has been demonstrated that collaborative decision making between junior doctors and radiographers produces a statistically significant improvement in radiographic interpretation positively impacting on junior doctors' decision making (Kelly et al., 2011). Communication allowing collaborative decision making has been seen to result in a combined accuracy in radiographic interpretation of

radiographers and emergency doctors to being nearly equal to that of a radiologist (Willis and Sur, 2007). The potential for improved accuracy of diagnosis through collaborative decision making and subsequent patient care is evident.

With collaborative practice it seems that it is not so important to know what is wrong, so much as to identify that something is wrong. Infrastructure that allows for an individual to say ‘(s)omething’s wrong. I’m not sure what it is...’ (Leonard et al., 2004, p. 87) can effect a positive outcome for patients. Although in some cases the perception of a radiographic abnormality does constitute the diagnosis (Hare, 2007), because some lesions such as fractures are pathognomonic (Nightingale, 2005), radiographic interpretation is not necessarily diagnostically specific. For example, in the interpretation of intensive care chest radiographic images it has been recommended that it is not necessary to specify the cause of pulmonary shadowing because making histological predictions as to the nature of pulmonary shadowing are unreliable and may in fact mislead the referring clinician (Adams, 1979). The perception of a radiographic abnormality may not identify its aetiology: for some lesions to be interpreted, and so diagnosed with certainty, requires assimilation with the clinical assessment and perhaps utilisation of other diagnostic or imaging modalities.

Until radiographers receive the educational preparation and support necessary to provide definitive radiographic interpretation, the perceptual experience of radiographers must be recognised and pathways provided to allow radiographers to say that *I don’t think this is probably right and I can’t say why but it just doesn’t look right*. Research has demonstrated that, while Australian radiographers sometimes exhibited a decrease in the level of accuracy when they were required to provide a written description of their radiographic interpretation, this can be attributed to a difficulty with converting observations into words rather than a failure to identify the abnormality (Smith et al., 2009b). It would seem as Polanyi (1967, p. 4) suggests ‘...we can know more than we can tell’.

This study has addressed the aims of the research in its exploration of aspects of contemporary rural radiographic practice. Rural radiographic practice however continues to evolve, and radiographic practice into the future will continue to be shaped by advances in imaging technology and changes in healthcare service delivery.

Changes to radiographers' scope of practice may increase the dilemma of radiographers' disclosure to patients. The APWG report recommends greater public awareness of radiographers' advanced practice (Smith et al., 2009a). If these recommendations in the AWPB report are instigated, then radiographers' participation in radiographic interpretation will not only become formalised as some radiographers undertake radiographic reporting, but the public will become aware of this aspect of advanced practice of some radiographers. This will potentially present difficulties for rural radiographers as it may be assumed that all radiographers will have formalised radiographic interpretation skills. Referrers and patients may incorrectly assume that all radiographers hold formal interpretation skills and difficulties in radiographers with interactions with referrers may result if referrers expect a level of interpretation knowledge that a radiographer does not possess.

This thesis introduces the topic of rural radiographers' disclosure to their patients into rural radiographic research. This topic has remained an unexplored, hidden dimension of rural radiographic practice leaving rural radiographers to develop their own decision making framework to navigate through the ethical dilemmas that disclosure inevitably presents. This study has revealed that radiographers prefer not to lie in their disclosure to their patients although they do frame their replies around telling the truth¹³⁹. There exists the potential for disclosure difficulties with patients, if patients becoming aware of radiographers undertaking interpretation assume that all radiographers will be in possession of a radiographic interpretation for their radiographic images that they should disclose. It is therefore essential that radiographers' position with regards to disclosure of their radiographic opinion to their patient is clarified.

Disclosure will continue to present a dilemma for radiographers. The newly introduced *Code of Conduct for registered health practitioner*¹⁴⁰ advises radiographers that, within relevant legislative boundaries they should, discuss 'with patients or clients their condition and...respond...to questions from patients or clients and keep...them informed about their clinical progress...' (Medical Radiation Practice Board of

¹³⁹ Telling the truth is discussed in chapter 7.

¹⁴⁰ *Code of Conduct for registered health practitioner* is discussed in greater detail in chapter 2 on page 99.

Australia, 2012, p. 6). Perhaps the ethical framework that rural radiographers have constructed to guide their disclosure to patients is best practice, but this has not been tested. A further difficulty is that a great deal of the knowledge that radiographers utilise in their decision making is based upon tacit knowledge and will not easily translate into codified knowledge (Insch et al., 2008).

Rural radiographers move from what may be an intuitive recognition of a radiographic abnormality to the formation of a radiographic interpretation by drawing on explicit and tacit knowledge. It is from this background knowledge within the patient focussed world of rural radiographic practice that rural radiographers construct a radiographic opinion. Radiographer's radiographic opinion is shaped by the implications of the diagnostic gap. Rural radiographers' strategies for conveying their radiographic opinion is impacted upon, not only by the diagnostic gap, but also radiographers' relationships with referrers and patients, the biomedical framework and the socialisation of these healthcare providers in the context of rural radiographic practice.

Radiographic practice into the future may be shaped by advances in imaging technology and changes in healthcare service delivery but, as long as there is a diagnostic gap, patient care is at risk and radiographers are ideally placed to provide some compensation and to improve patient outcomes. While radiographers remain silent and the practice remains largely hidden, it may be assumed that, in the absence of a radiologist, all radiographic interpretation is undertaken by the referring clinician and rural radiographers will continue to be the invisible hand guiding referrers and patients towards the best possible outcome. It would be negligent of decision makers not to take into account the significant positive impact that involving rural radiographers in collaborative radiographic interpretation can have on patient care and to make provision for this in healthcare and workforce reform. This will require determination of radiographers' role in frontline radiographic interpretation and ideally the development of a nationally recognised framework. Rural radiographers' skills in radiographic image perception, interpretation and communication must be recognised, for while they remain informal and not explicitly stated as is occurring now, there is a risk that these components of rural radiographic practice will be overlooked during healthcare reforms and patient care will be adversely affected.

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Appendices

Appendix A	Chronology of Radiography and Radiographer Training in Australia
Appendix B	Description of an X-ray tube
Appendix C	Detrimental sequelae of exposure to ionising radiation
Appendix D	<i>Medical Practitioners Registration Amendment Act 205 (Queensland)</i>
Appendix E	Flowchart of Research Design
Appendix F	Questionnaire Results
Appendix G	Human Research Ethics Committee Approval
Appendix H	Invitation to participate in survey
Appendix I	Contact details for participation in interview and/or focus group
Appendix J	Information Sheet for interviews
Appendix K	Consent Form for Interviews
Appendix L	Questionnaire
Appendix M	Pilot of questionnaire data
Appendix N	Interview Guide
Appendix O	Phases of Thematic Analysis
Appendix P	Flowchart: Key theme: Disclosure of radiographic opinion to patients
Appendix Q	Venn diagram of relationship between key themes

Appendix A: Chronology of Radiography and Radiographer Training in Australia

Development	Date	Radiography Qualifications
X-rays discovered	8 November 1895	Radiography self-taught
First medical radiographic image produced by Wilhelm Röntgen	28 December 1895	
Vienna newspaper reports discovery of X-rays	5 January 1896	
London newspaper reports discovery of X-rays	7 January 1896	
Australian newspapers report discovery of X-rays	31 January 1896	
First documented radiographic image produced in Australia	4 March 1896	
Association of X-ray Technicians formed in Melbourne	1923	
	1940	X-ray Technician certificate (RMIT)
Conjoint Board formed	1950	
	1950-1977	Associate Diploma (RMIT)
	1978	Diploma (RMIT)
	1985 (Tasmania)	Technical College certificate replaced with University of Tasmania Diploma
Dissolution of Conjoint Board. AIR commences SoA	1987	
	1992	Move to University degree completed in all Australian states except Tasmania
	1993 (Tasmania)	Last students graduate in Tasmania with a University of Tasmania Diploma

(Baird, 1992; Lewis, 2003; Tress, 1991)

Appendix B: Description of an X-ray tube

The basic components of an X-ray tube are an evacuated glass tube, a negative electrode which is referred to as a cathode, a positive electrode which is referred to as an anode, and a spiral incandescent filament which is often tungsten (Hay and Hughes, 1983; Meschan and Farrer-Meschan, 1960; Ryan et al., 1996). The filament which is heated by a low voltage supply releases electrons by thermionic emission (Hay and Hughes, 1983) and is measured in milliamps (mA) (Murphy et al., 2005b). A voltage in the order of kilovolts (kV) is applied across the X-ray tube between the cathode and the anode (Meschan and Farrer-Meschan, 1960) resulting in a potential difference across the tube. The electrons released by the filament are accelerated by the potential difference across the tube towards the anode (Hay and Hughes, 1983). The accelerated electrons strike the target anode (Hay and Hughes, 1983; Meschan and Farrer-Meschan, 1960) to produce ionising radiation, a form of electromagnetic radiation with a wavelength of 10 to 0.01 nanometers (Meschan and Farrer-Meschan, 1960), which is generally referred to as X-rays. X-rays are only 1/10,000 the wavelength of visible light (Meschan and Farrer-Meschan, 1960, p. 1) and it is this property that allows them to penetrate materials which would absorb or reflect light (Hay and Hughes, 1983).

Appendix C: Detrimental sequelae of exposure to ionising radiation

In the infancy of radiography, unshielded X-ray tubes were employed and operated by unshielded personnel with sometimes devastating effects. The hazardous nature of X-rays was revealed among X-ray pioneers in the form of erythema, hair loss, superficial ulceration and skin cancers (Wallace, 1993). The first evidence of the potential for X-rays to produce a destructive effect on human skin was published only three months after Röntgen's discovery was revealed to the world in January 1896 (Wallace, 1993; DiSantis, 1986). Many of the pioneers of radiology suffered from the effects, or indeed died from their prolonged exposure to X-rays (DiSantis, 1986; Feldman, 1989; Wallace, 1993). Dr Frederick Clendinnen, who is credited with being the first medical practitioner to produce a radiographic image in Australia (Ryan et al., 1996), suffered X-ray burns that resulted in malignancy and the subsequent loss of three fingers (Wallace, 1993). Röntgen escaped from the effects of X-rays not because he was aware of their hazardous nature, but because of his method of experimentation (Wallace, 1993). During experimentation with X-rays Röntgen worked behind a metal lined cabinet, and it is this shielding, along with the short period of time that he worked on X-rays that afforded him a level of protection (Wallace, 1993). In the UK in 1921, in response to the obviously detrimental effects of exposure to radiation, the British X-Ray and Radium Protection Committee was established (Wallace, 1993) and presented the first measures for radiological protection (Hay and Hughes, 1983). Radiological protection measures that are designed to protect both the patient and those working with X-rays are more sophisticated versions of the protection that Röntgen serendipitously afforded himself. In order to provide protection, radiation exposure times are kept to a minimum and only essential personnel remain in the room during radiological examination with these people protected by protective aprons or shields (Murphy et al., 2005b). X-ray technology has also progressed and affords a great deal more protection to personnel. X-ray tubes are shielded by a tube housing (Hay and Hughes, 1983), and the X-ray beam is not only filtered, but also collimated so that only the area of interest on the patient is exposed to X-rays (Murphy et al., 2005b).

Appendix D: *Medical Practitioners Registration Amendment Act 2005 (Queensland)*

An Act to amend the Medical Practitioners Registration Act 2001

‘161 Claims by persons as to registration and prohibited conduct by non-registrants...

(2) A person who is not a registrant must not, by means of any

conduct in contravention of subsection (1)—

(a) under colour or pretence of being registered under this

Act or of being eligible to be registered under this Act—

(i) obtain any employment; or

(ii) obtain access to a hospital, clinic, medical practice

or other place; or

(iii) carry out, or purport to carry out, a surgical

operation, procedure or treatment; or

(iv) conduct, or purport to conduct, a medical

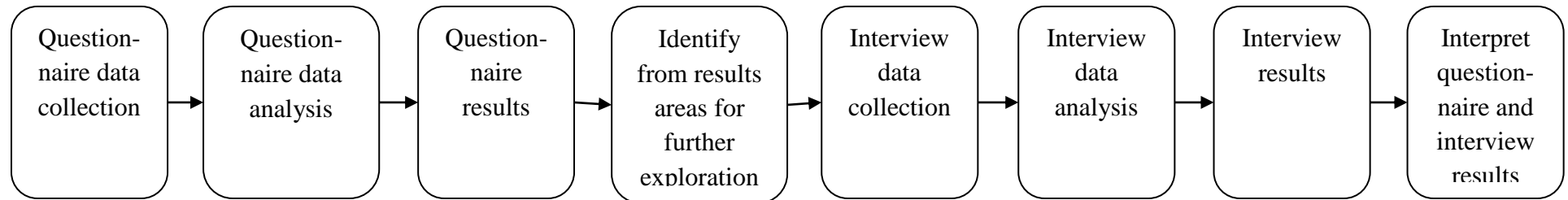
consultation with a person or a medical

examination of a person; or

(v) diagnose, or purport to diagnose, an illness or the

absence of an illness; or...’

Appendix E: Flowchart of Research Design



Procedures Sample rural Radiographers Administer Questionnaire	Procedures Descriptive analysis	Procedures Summarise major findings	Procedures Identify areas for further explanation. Identify Participants	Procedures Recruit interview participants	Procedures Thematic analysis	Procedures Describe themes with sample quotes	Procedures Synthesise the two sets of data into one discussion section
Products Respondents (n=60) Numeric and text data	Products Frequencies, Percentages Thematic analysis of free text data	Products Summary tables, charts and graphs. Descriptions of results	Products Interview guide	Products Participants (n=9) Interview transcripts	Products Themes associated with rural radiography, interpretation, communication and disclosure of radiographic opinion	Products Description of themes	Products Discussion of results

Adapted from (Plano Clark and Creswell, 2008, p. 468)

Appendix F: Questionnaire Results

This appendix reports the results of the questionnaire distributed to cohorts of rural radiographers from New South Wales, Western Australia and Tasmania, between August and November 2007. The purpose of the questionnaire was to provide descriptive data of the rural radiographer population along with information surrounding radiographic interpretation and disclosure of radiographic opinion and to provide initial lines of inquiry for the interviews.

The questionnaire was specifically developed to elicit information on

1. demographic data (age, gender, qualifications, training, and current employment)
2. reporting of radiographs
3. radiographic opinion
4. radiographic interpretation
5. disclosure of radiographic opinion
6. medico-legal responsibility for disclosure of radiographic opinion
7. X-raying family/friends
8. preparation for rural practice.

The data from the returned completed questionnaires was analysed using SPSS® for MS Windows Version 15.0 (2006) for Windows software. The results of this analysis are presented in the following using each of the topics of interest as sub-headings.

1. demographic data (age, gender, qualifications, training, and current employment)

The radiographers revealed a wide range of ages from 21 to 61 years of age with a median age of 40.6 years. Over two-thirds of the radiographers were female and, although it is not possible to accurately reflect on the number of rural radiographers sampled compared to the actual number of radiographers working in rural Western Australia, Tasmania and New South Wales¹⁴¹, the gender distribution of the sampled population sits within ABS census data estimates. The rural radiographers from only three states of Australia were sampled for this study which sets the rural radiographer

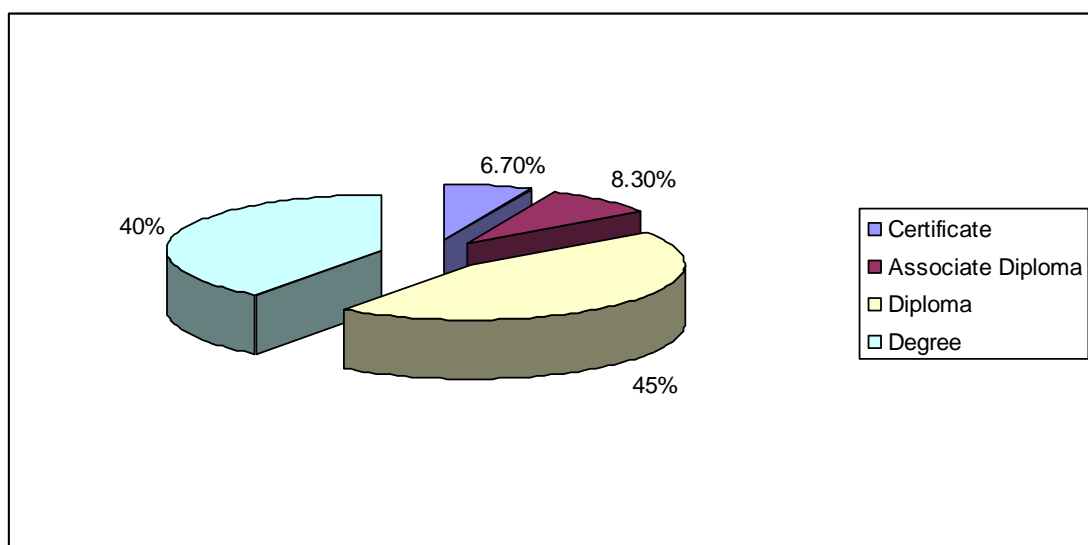
¹⁴¹ Discrepancies exist with using ABS data on the rural radiographer population which are explained in greater detail on page 26. Scott and Cheng (2010) also advise caution with using census data.

population at a total of approximately 1,064 individuals with a gender distribution of 32.4% male and 67.6% female. Comparing the census demographic data on rural and remote radiographers from the three states sampled to the sample population from this study revealed that 28.3% of the respondent radiographers were male and 71.7% of the radiographers were female which demonstrates the same whole numbers ratio of 2:1.

The respondent radiographers had held their radiographic qualifications for between 1 and 41 years with a median of 18.6 years. The age of the radiographers, along with the number of years qualified covering a period of 40 years range, resulted in the radiographers holding radiographic qualifications that ranged from certificate to degree. The changes in radiographic qualification that have evolved along with the changes in radiographic technologies throughout radiological history, are reflected in the collected data. Fitting within the timeline of radiographical qualifications, all of the radiographers who had been qualified for 7 years or less held a degree, and those radiographers who had qualified 9 years to 24 years ago held a mix of degree and diploma. The radiographers who had qualified 25 to 27 years ago held either an associate diploma or a diploma and those radiographers who qualified 28 years or more ago held a mix of certificate, associate diploma and diploma.

The highest radiographic qualification held by the majority of the radiographers was a diploma (45%) and the next most common qualification was a degree (40%). The breakdown of radiographer qualifications is demonstrated in figure 1.

Figure 1: Radiographic Qualification



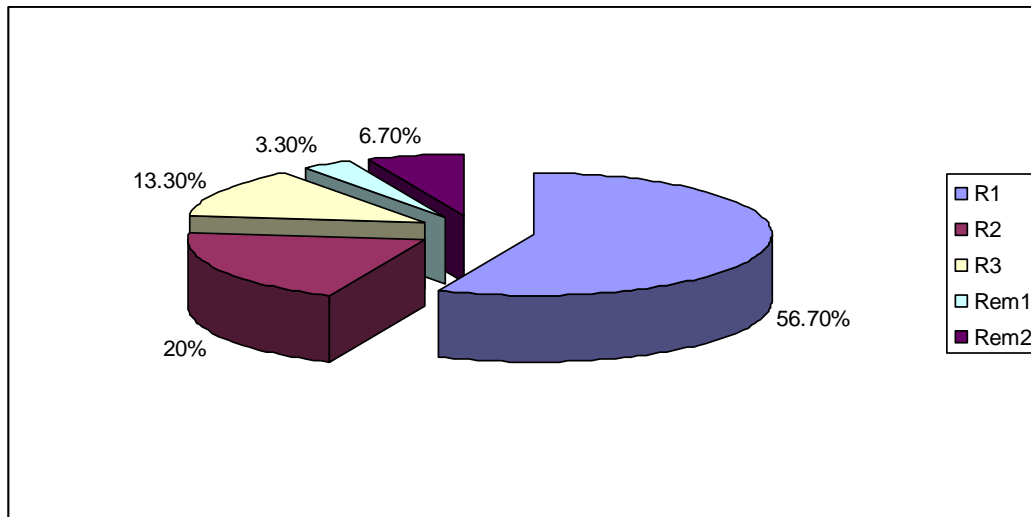
The data collected also made it possible to determine that five of the radiographers had upgraded their radiographic qualifications. Upgrading of qualifications has occurred because, as the base radiographic qualification for radiographers changed, those who held the previous base qualification were sometimes offered the opportunity to upgrade their qualification through various educational institutions. The data revealed that three of the radiographers had upgraded from a certificate to a diploma, and two from a diploma to a degree. Furthermore, the radiographers who had upgraded their radiographic qualification initially qualified in radiography 17 years or more ago. The majority of the rural radiographers gained their radiographic qualification in Australia (78.3%). Those who received their radiographic qualifications outside of Australia qualified in New Zealand, South Africa, the United Kingdom and Zimbabwe. In addition to their radiographic qualification, exactly half of the radiographers revealed that they hold a postgraduate qualification. Ultrasound was the most common postgraduate qualification with 41.4% of this 50% holding an ultrasound qualification.

In terms of the nature of the facility that provided their radiographic training or study, 45% of the radiographers indicated that they had received their training at a university situated within a capital city and 11.7% of the radiographers had received their training at a university situated within a regional city. Therefore, in this study over half of the radiographers, a total of 56.7%, were university trained in a metropolitan area. The questionnaire data also showed that 21.7 % of the radiographers received their training at a hospital in a capital city, 6.7% of respondents received their training at a hospital in a regional city and 11.7% of respondents received their training at a hospital in a rural town. A total of 40.1% of respondents were hospital trained. This finding is also supported by the documented timeline of radiographers' training as the move to university based training for radiographers was not completed until 1992 and so radiographer training for the timeframe represented by the respondent radiographers also incorporated hospital based training. Further interrogation of the data reveals that 66.7% or over two-thirds of these now rural radiographers trained for radiography in cities with only 11.7% trained in a rural town.

Data was also collected around the current employment of the radiographers and this has been collated and is presented in the pie chart below. This data indicated that

the majority of the radiographers (56.7%) were working in the larger population centres and the smallest number of radiographers was working in the most rural classification of Rem 2. This trend was expected with the literature revealing that allied health professionals are not present in large numbers in rural practice (Blue, 2002).

Figure 2: Current employment by RRMA classification



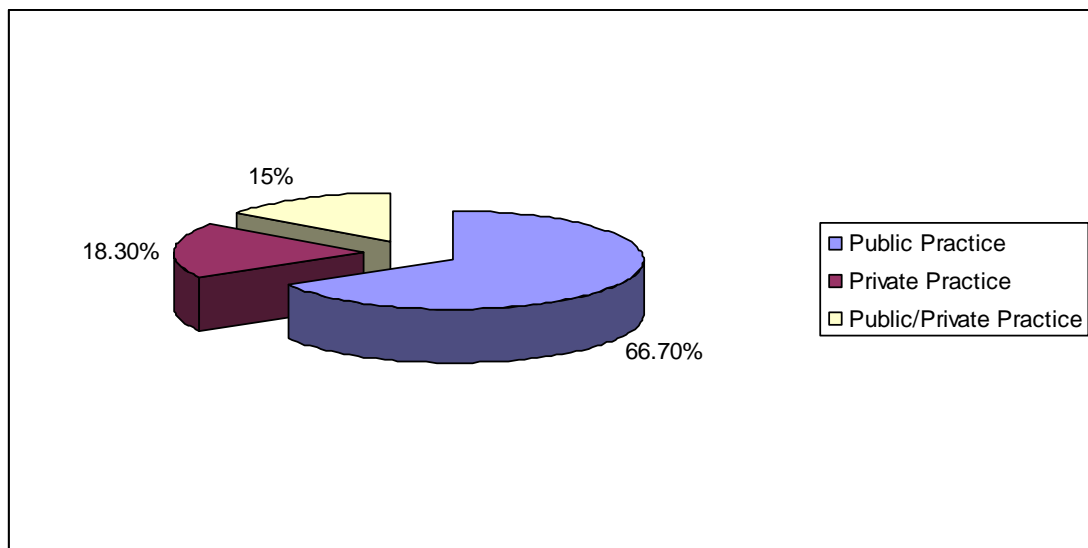
Although 85% of the radiographers were working at the major health facility for their area, and for the remaining 15% the distance from the major health centre ranged from ‘around the corner’ to three hours away, the data collected did not include any questions as to whether they worked at the only medical imaging department for the area. Therefore it is not possible to draw any meaningful conclusions about the specific number of radiographers relative to the population. However, table 1 which has been established from the questionnaire data reveals that in the larger population centres the radiographers had the greatest number of radiographer colleagues.

Table1: RRMA classification and number of radiographers

RRMA Classification	FTE radiographers range	Respondent radiographers
R1.	3.5–4.0	56.7%
R2.	1–12	20%
R3.	1–3	13.3%
Rem1.	1–2	3.3%
Rem2.	1–3	6.7%

The majority of the radiographers (66.7%) were working in public practice. A total of 18.3% of radiographers were working in private practice and a further 15% were working in a mix of public and private. This is a finding that is also supported by the field literature. Medical Imaging Services, of which diagnostic radiography is a component, are provided by a mix of public and private providers so that radiographers work in a private or public hospital, health centres and private practice (Willis et al., 2005).

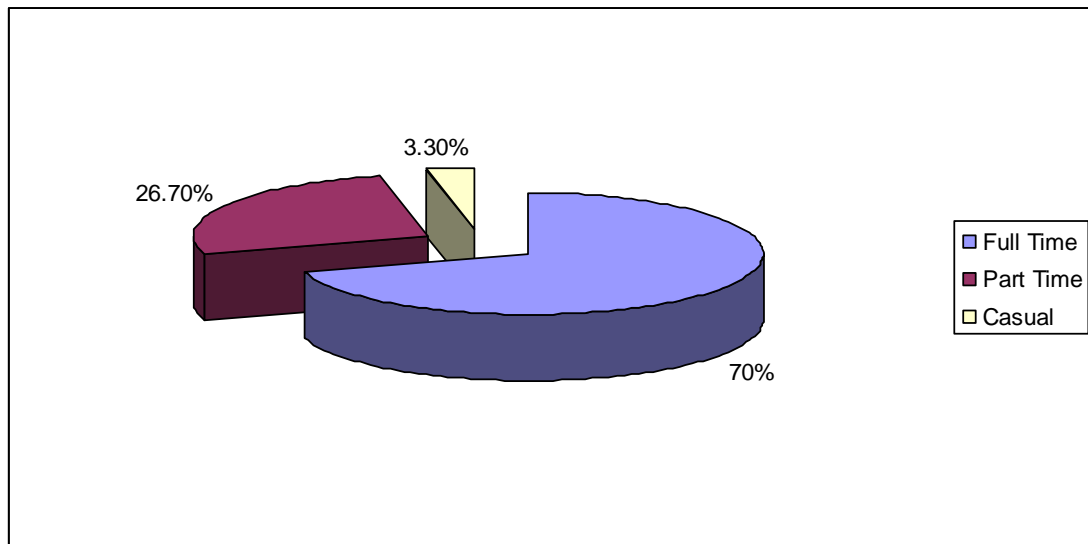
Figure 3: Sector for Employment



The skew of the findings of the majority of radiographers working in public practice is in contrast to estimates of the total Australian radiographer workforce documented by Scott and Cheng, (2010) where it has been estimated that only 35% work in public practice and the remaining 65% work in private practice. The key to this discrepancy between the study data and the total radiographer workforce estimates may be found in the further analysis of the survey data. The data revealed that it is not until the population is above 10,000 that radiographers have indicated that they are employed in private practice. Where the population is R3, which equates to a population of 10,000 or less, the radiographers are employed in public practice. It is not until the population rises to the R2 RRMA classification, where the population is between 10,000 and 24,999 with a co requisite that the radiographers have three or less FTE radiographic colleagues, that the radiographers are employed in private practice.

The majority of the radiographers were working full time (70%) with only 26.7% working part time and 3.3% working casual hours. The employment status of the radiographers is demonstrated in figure 4.

Figure 4: Employment Status



Comparing employment status with gender and age data revealed that all of the male respondents were working full time and that the age for change in employment status for females from full time to part time or casual was 30 years of age.

2. reporting of radiographs

The respondent radiographers revealed that all radiographic images are ultimately reported by a radiologist. As described in chapter 1 there is always a period of some delay between image acquisition and the availability of the radiologist's report. For the majority of the medical imaging departments where the radiographers worked, the usual turnaround time for reporting ranged from same day 31.7%, next day 18.3%, to within 3 days 31.7%. However for the smaller centres, namely Rem1 and Rem2, the best usual turnaround time reported is the next day. The radiographers also provided comments on the other factors that influence the turnaround time for reporting of films.

Comment data

- *Computer network connection (Teleradiology)*
- *Radiologist work load*

- *Priority status – according to clinical need, inpatient or outpatient status*
- *Whether a radiologist is here usually 3-4 ½ days. Availability of radiologist.*

The question pertaining to the radiographers' proximity to a radiologist revealed that it is only for the larger rural centres where the population is greater than 10,000 that a radiologist is on site during business hours. In the smaller rural centres a radiologist is generally offsite although they may provide a visiting service. Radiological services for the majority of the smaller sites are provided by teleradiology.

The assumed and anticipated delay in the availability of a radiological report from the same day to within three days, indicates the need for the referrer to seek alternate means of securing a radiographic interpretation. The respondent radiographers revealed the following where the referrer urgently requires results of a patient's radiographic examination. It was possible for respondents to indicate more than one possible option.

- the referring clinician consults the radiographer (45%)
- the patient is transferred to a major centre (11.7%)
- the films are couriered (3.3%)
- the referring clinician consults the radiologist (30%)
- teleradiology is used (70%)
- the referring clinician diagnoses if an urgent report is required (26.7%)

3. radiographic opinion

The question around radiographers' involvement in providing their radiographic opinion revealed the following results.

- 3.4% of respondents said that they were never called upon for input into radiographic opinion
- 8.3% said that they were called upon monthly for input into radiographic opinion
- 25% said that they were called upon weekly for input into radiographic opinion
- 35% said that they were called upon daily for input into radiographic opinion
- 20% said that they were called upon several times daily for input into radiographic opinion

The respondents provided the following comments:

Depends on the place I'm at.

Depends upon the doctor, some ask very often, others never do

Prior to teleradiology several times daily. Started teleradiology 12 months ago

Depends when I am on call etc

The questionnaire results revealed that all radiographs produced by the respondent rural radiographers are reported by a radiologist. However the data further revealed that, despite the ultimate provision of a radiologist's report, rural radiographers are called upon for input into radiographic opinion. Comparative analysis of the data revealed that, when teleradiology is one of the options utilised for an urgent report when the radiologist is not on site, 63.3% of respondents still indicated that they were called upon to have input into radiographic opinion. Furthermore, when clinician diagnosis is one of the options utilised for an urgent report when the radiologist is not on site, 27% of respondents still indicated that they were called upon to have input into radiographic opinion.

The question around who asks the rural radiographers for their radiographic opinion, for which it was possible for the respondent to indicate more than one reply, revealed that:

- 88.3% of respondents said that the referring clinician had asked for their radiographic opinion
- 71.7% of respondents said that nursing staff had asked for their radiographic opinion
- 60% of respondents said that the patient asked for their radiographic opinion
- 38.3% of respondents said that the patient's family had asked for their radiographic opinion.

4. radiographic interpretation

The majority of the respondent radiographers revealed that they do not hold any formal qualification in radiographic interpretation with only 3.3% of the respondents indicating that they held formal qualifications in radiographic interpretation acquired as part of

their medical imaging degree. The respondents who had informally acquired radiographic interpretation skills revealed the following skill acquisition pathways:

- *during training, we were taught to identify basic pathology on most anatomical regions*
- *have sat with radiologists during reporting sessions*
- *through years of clinical practice*
- *discussion with colleagues*
- *case study meeting*

5. disclosure of radiographic opinion

The questions around radiographers' disclosure of their radiographic opinion to patients revealed the following results. Seventy percent of respondents replied that they have provided a patient with their radiographic opinion on the films that they have produced. Thirty percent responded that they did not provide a patient with their radiographic opinion on the films that they have produced. Of the 70% who said yes, 83.3% said that their disclosure was dependent upon the diagnosis.

The comment data provided by the respondents is listed in the following:

- *more complex results not given as Dr should do this*
- *only fractures or other pathologies where treatment is straightforward and no emotional/legal quagmires may be stumbled into*

Furthermore, 55% of respondents answered that they believe a radiographer should disclose their radiographic opinion to the patient and provided the following comment data:

In responding in the affirmative the respondents indicated:

- *Can often relieve anxious pt allowing for delays in final diagnosis.*
- *Depends on circumstance but frequently encourage them to return to the doctor for suitable treatment.*
- *Depending on the impact the diagnosis will have, and how obvious the pathology is*
- *Within their individual competencies & it aids professional community attitudes*

In responding in the negative the respondents indicated:

- *Without formal training not appropriate*
- *As we are not formally trained to do so and as such are left open to litigation.*
- *In general it's the Doctor's place to discuss diagnosis. We don't know the patient well enough or their reaction to news, or what other tests have been done.*

The complex nature of rural radiographers' disclosure to patients is demonstrated in further analysis of the data. While 70% of the rural radiographers indicated that they do provide a patient with their radiographic opinion, only 55% believe that they should. A further 16% who said that they do provide a patient with their radiographic opinion don't believe that they should, and 3% said that they don't believe that they should.

6. medico-legal responsibility for disclosure of radiographic opinion

The ambiguity around the medico-legality of rural radiographers' disclosure of their radiographic opinion was revealed in the questionnaire data. While 50% of respondents believe that they will be held medico-legally responsible for disclosing their radiographic opinion, 25% believe that they will not be held medico-legally responsible for disclosing their radiographic opinion and 23.3% don't know their medico-legal position with regard to disclosure. Where the rural radiographers indicated that they did not believe that they would be held medico-legally responsible for disclosure of their radiographic opinion, they revealed that in their disclosure they often added a disclaimer such as:

- *I stipulate that films need final reporting by radiologist and that my opinion is not a qualified opinion.*
- *I always back up any comment with the need to get an official result.*

Further analysis of the data revealed that 44% of the respondents who indicated that they have provided a patient with their radiographic opinion believe that they will be held medico-legally responsible for that disclosure, 32% responded that they don't believe that they will be held medico-legally responsible and 24% indicated that they don't know their medico-legal standing. However, 67% of the respondents who indicated that they have never provided a patient with their radiographic opinion believe that they will be held medico-legally responsible for their disclosure.

The respondent rural radiographers' belief of their medico-legal responsibility of disclosure to referrers indicated that, where the referring clinician consults with the

radiographer when an urgent report is required, 31% of the respondents believe that they will be held medico-legally responsible for disclosure of radiographic opinion.

7. X-raying family/friends

The questions around where the rural radiographers were living in regard to their place of employment and also the existence of pre-existing relationships with their patients, revealed the following results. Ninety percent of the respondent rural radiographers indicated that they were living in the same community where they were working. The breakdown of the other 10% of respondents revealed that half of these radiographers were relief radiographers employed in the public sector¹⁴² and the other half were living 17km, 40km and 55km respectively from their place of employment. As outlined in chapter 1, living and working in a small town is likely to result in a healthcare professional becoming a friend or at least social acquaintance to many of the other residents of that town, and that caring for family and friends may prove unavoidable in rural practice. The findings in the questionnaire support this as only 3.3% of the respondents indicated that they are never required to X-ray friends or family members. Further analysis of these respondents' replies revealed that these radiographers worked in R1 and had lived in the same community where they worked for three years or less. The radiographers' responses revealed that 28.3% rarely had to X-ray friends or family members, 53.3% occasionally had to X-ray friends or family members and 13.6% often had to X-ray friends or family members. The radiographers provided a range of comments for the issues that X-raying people whom they know raise for them:

- *Perhaps asking another radiographer – when available for more invasive procedures*
- *privacy – small town*
- *Lots of friends wanting my diagnosis on their films without waiting to get radiologist's report*
- *It is part of the position of a rural/remote radiographer and does not worry me at all.*
- *Don't like to have to repeat films on people you know*
- *Emotionally difficult if possibly serious problem*
- *Can be embarrassing for the patient*

¹⁴² WA has a relief pool of radiographers to support rural radiographers run by Department of Health, Government of Western Australia, WA Country Health Service.

- *Confidentiality issues – I would never discuss who came into X-ray but the patient may feel uncomfortable and worry that I would tell people.*

8. preparation for rural practice

With regard to their belief of their preparation for rural radiographic practice, 66.7% of the respondents indicated that their training as a radiographer prepared them for rural practice, while 31.7% indicated that their training did not prepare them for rural practice. Those respondents who believed that their training prepared them for rural practice provided the following comments.

Prepared for rural practice:

- *Training in a rural teaching hospital with travelling radiographic services provided to associated smaller hospitals gave me a rounded understanding of the responsibilities of rural radiography.*
- *However in a rural situation I don't think any amount of training is sufficient and much of the needed experience can only be learnt hands on.*
- *early interaction with referring clinicians requiring/requesting provisional diagnoses*
- *To a limited extent e.g. radiograph interpretation. A lot of experience in interpretation is also required however.*
- *Because predominantly hospital trained this made it easy to adapt to variety of situations.*

However the respondents who did not believe that their training prepared them for rural practice provided the following comments.

Not prepared for rural practice:

- *In one's training there is always someone more senior to ask for advice, with radiologists easily available if required. Sometimes in rural practice there is no one else to give advice & no radiologists immediately available.*
- *as well as almost NO emphasis on fracture/pathology recognition which would be very useful in after hours/weekend work where my opinion is sought on almost every patient.*
- *Uni prepared me to perform most radiographic examinations but experience has been the best educator for me in a rural practice.*

- *No training in providing info to referring docs e.g.: What they want to know. What's important clinically. What you are qualified to say. (Learnt all this on the job – the hard way)*

Comparing the facility for training to preparedness for rural practice revealed that all the respondent radiographers who trained in a hospital in a rural town believed that their training prepared them for rural practice, but for the other training facilities some of the radiographers began to indicate that did not believe that they were prepared for rural practice. Where the respondents indicated that the training facility was a university in a capital city, very nearly half the radiographers did not believe that their training prepared them for rural practice.

Appendix G: Human Research Ethics Committee Approval

COPY	Private Bag 01 Hobart Tasmania 7001 Australia Telephone (03) 6226 2764 Facsimile (03) 6226 7148 Marilyn.Knott@utas.edu.au http://www.research.utas.edu.au/index.htm	
	MEMORANDUM	
HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK		

FULL COMMITTEE APPLICATION APPROVAL

17 January 2007

Dr Rosalind Bull
Rural Health
Private Bag 1372
Launceston

Ethics ref: H9204

Rural radiography, radiographic interpretation and disclosure of diagnosis.

Student: Kathryn Squibb (PhD)

Dear Dr Bull

The Tasmania Social Sciences HREC Ethics Committee approved the above project on 22 December 2006.

All committees operating under the Human Research Ethics Committee (Tasmania) Network are registered and required to comply with the *National Statement on the Ethical Conduct in Research Involving Humans 1999* (NHMRC guidelines).

Therefore, the Chief Investigator's responsibility is to ensure that:

- 1) All researchers listed on the application comply with HREC approved application.
- 2) Modifications to the application do not proceed until approval is obtained in writing from the HREC.
- 3) The confidentiality and anonymity of all research subjects is maintained at all times, except as required by law.
- 4) Clause 2.37 of the National Statement states:
An HREC shall, as a condition of approval of each protocol, require that researchers immediately report anything which might warrant review of ethical approval of the protocol, including:
 - a) *Serious or unexpected adverse effects on participants;*
 - b) *Proposed changes in the application; and*
 - c) *Unforeseen events that might affect continued ethical acceptability of the project.*


The report must be lodged within 24 hours of the event to the Ethics Executive Officer who will report to the Chairs.

A PARTNERSHIP PROGRAM IN CONJUNCTION WITH THE DEPARTMENT OF HEALTH AND HUMAN SERVICES

- 5) All participants must be provided with the current Information Sheet and Consent form as approved by the Ethics Committee.
- 6) The Committee is notified if any investigators are added to, or cease involvement with, the project.
- 7) This study has approval for four years contingent upon annual review. An *Annual Report* is to be provided on the anniversary date of your approval. Your first report is due [12 months from 'Ethics Committee Approval' date]. You will be sent a courtesy reminder by email closer to this due date.
Clause 2.35 of the National Statement states:
As a minimum an HREC must require at regular periods, at least annually, reports from principal researchers on matters including:
- a) *Progress to date or outcome in case of completed research;*
 - b) *Maintenance and security of records;*
 - c) *Compliance with the approved protocol, and*
 - d) *Compliance with any conditions of approval.*
- 8) A *Final Report* and a copy of the published material, either in full or abstract, must be provided at the end of project.

Yours sincerely



 Ethics Executive Officer

Appendix H: Invitation to participate in survey.

Title of Project: Rural radiography, radiographic interpretation and disclosure of radiographic opinion.

My name is Kate Squibb and I am a rural radiographer and PhD candidate with the University of Tasmania, under the supervision of Dr Rosalind Bull (Ph 03 6324 3423) and Professor Judith Walker (Ph 03 6430 4561). You have been invited to participate in this study because you are a radiographer currently working in a rural area. In the context of this project a rural radiographer has a statement of accreditation from the Australian Institute of Radiography and provides radiographic services to a community with a population of less than 99 999. I have not been given access to any private identity information or contact details; this information sheet and attached survey have been distributed to you through Dr Tony Smith.

If you fit the above definition I invite you to participate in my project investigating your experience of radiographic interpretation and diagnosis in rural practice and the issues that arise from this. The idea behind this project is that the experience of current rural radiographers can be used to inform and prepare all rural professionals that will incorporate radiography, radiographic interpretation and radiographic opinion within their scope of practice.

Your participation involves completing the attached survey, the results of which will form part of my PhD thesis. It will take 25 to 30 minutes to complete. Simply tick the most appropriate response, and return the survey to the researchers in the return envelope within 7 days if possible.

Only aggregate data from the survey will be reported, which in any case does not request your name. The questions have been designed to ensure that collected data cannot be linked to an individual or institution. It follows that your participation is anonymous. The completed surveys will be stored in a locked filing cabinet and on password protected files at the University Department of Rural Health Tasmania for 5 years, after which they will be destroyed by shredding or deleting.

A copy of the summary of the results of the survey will be made available on the University Department of Rural Health website www.ruralhealth.utas.edu.au

You are under no obligation to complete this survey. Please understand that by completing and returning this survey distributed with this letter of invitation you are consenting to participation in the survey component of this study.

This study has received ethical approval from the Human Research Ethics Committee (Tasmania) Network, which is constituted under the National Health and Medical Research Council. The committees under the Network use the *National Statement on Ethical Conduct in Research involving Humans* to inform their decisions. If you have

any concerns of an ethical nature or complaints about the manner in which the project is conducted you may contact the Ethics Officer of the Network on (03) 6226 2764.

An opportunity exists for further involvement in this project in the form of interview and/or focus group. The purpose of the interview is to test the findings from the literature review along with the aggregate of the analysis of the surveys. Participants will initially be interviewed for approximately one hour, either by telephone or face to face, at a mutually convenient venue, date and time. The purpose of the focus group is to test the veracity of the themes arising from the analysis of the literature, and the surveys and interviews. If you fit the selection criteria and are willing to participate further in this study, please provide your contact details on the separate form included and return to the researchers in the second return envelope supplied. You may choose to participate in the interview and/or the focus group, and will be sent an information sheet appropriate to the stage you have expressed interest in. The contact sheet will be separated from the survey and will be in no way associated with it. You will then be contacted to discuss your future involvement.

If you require further information or if the envelopes become lost please contact me on the details provided below.

Thank you for taking the time to read this information sheet. I hope you will be willing to participate in this study.

Kate Squibb

Ph: 03 6352 5524

Email: Kathryn.Squibb@utas.edu.au

University Department of Rural Health
University of Tasmania
Locked Bag 1372
Launceston
Tasmania 7250

Appendix I: Contact details for participation in interview and/or focus group.

Project Title: Rural radiography, radiographic interpretation and disclosure of radiographic opinion.

Name: _____

Preferred method and time for contact

(Please choose at least one contact method)

Address: _____

Phone number: _____

Email Address: _____

Time: _____

Do you wish to volunteer to participate in,
(Tick appropriate response)

☐ Interview only

☐ Focus group only

☐ Interview and focus group

Thank you for expressing an interest in participating in the interview or focus group. Please place completed form in return envelope and return to the researchers as soon as possible. Interview and focus group participants will be randomly selected from those radiographers expressing interest.

Appendix J: Information Sheet for interviews

01 December 2006

Project Title: Rural radiography, radiographic interpretation and disclosure of diagnosis.

Thank you for your expression of interest in participating in the interview stage of this project.

What is the purpose of this study?

The purpose of this study is to investigate radiographers' experience of radiographic interpretation and disclosure of diagnosis in rural practice and the issues that arise from this. The idea behind this project is that the experience of current rural radiographers can be used to inform and prepare all rural professionals that will incorporate radiography, radiographic interpretation and radiographic diagnosis within their scope of practice. The results of these interviews will form part of a PhD thesis being undertaken by Kate Squibb.

What are the benefits of the study?

The wider application of initiatives identified within this research project will benefit rural radiographers and all health care professionals preparing for a radiographic role within a rural environment. Specifically the knowledge generated from this study will contribute to rural healthcare professionals' management of the issues arising from radiographic interpretation and disclosure of diagnosis.

What would my participation involve?

If you agree to participate, you will initially be interviewed for approximately one hour, either by telephone or face to face, at a mutually convenient venue, date and time. During the interview you will have the opportunity to share your experiences of radiographic interpretation and disclosure of radiographic diagnosis. Your opinion will also be sought as to ways of better preparing radiographers and other healthcare professionals for the provision of radiographic services in rural practice.

The interview will be recorded and then transcribed word for word. Should it be necessary to seek clarification of any points raised in the interview the interviewer will contact you by telephone. At your request a copy of the transcript can be sent to you for verification and editing.

Will I receive payment for participating?

There is no payment for participating.

Is there any risk in my participation?

There are no anticipated risks associated with participating in this study, although an optional debriefing session will be available following the interview. This contact is provided to allow you the opportunity to discuss any concerns that you may have in

relation to your participation in this study. If you do become concerned when talking about your experiences you have the following options: (a) you may ask the interviewer to stop the interview; (b) you may tell the interviewer that you no longer wish to participate in the study; (c) you may tell the interviewer that you would like to talk to some one else (such as the Bush Crisis Line) and the interviewer will provide you with the contact details for this service.

Confidentiality and anonymity

The research team will not disclose your identity as a participant in this study, and will ensure that any data reported in the thesis or any subsequent publications arising out of the study is reported in a fashion that preserves your anonymity (whether by way of pseudonym for persons and places or by generalising its content). All research data will be stored in a locked filing cabinet at the University Department of Rural Health in Launceston and on password protected computer files. The data will be kept for 5 years and will then be destroyed by shredding and deleting.

Can I withdraw from the research if I wish?

Your participation is entirely voluntary, and in signing the consent form you have indicated your willingness to participate. In reply to questions posed you need only supply information that you feel comfortable relating, and you may withdraw consent at any time without explanation or penalty. Should you choose to terminate the interview, at your request I will destroy any data collected.

Who can I contact if I have any concerns about the research?

If you have any questions about the research please contact:

Researcher

Kathryn Squibb
PhD Candidate
University of Tasmania
Tel : (03) 6352 5524
Fax: (03) 6352 5537
Email: Kathryn.Squibb@utas.edu.au

Supervisor

Dr Rosalind Bull
Deputy Director
University Department of
Rural Health
University of Tasmania
Tel: (03) 6324 4016
Email: Rosalind.Bull@utas.edu.au

Supervisor

Professor Judith Walker
Professor of Rural Health
Faculty of Health Science
University of Tasmania
Tel: (03) 6430 4561
Email: Judith.Walker@utas.edu.au

Who can I contact if I have any concerns about the ethics of the research?

This study has received ethical approval from the Human Research Ethics Committee (Tasmania) Network, which is constituted under the National Health and Medical Research Council. The committees under the Network use the *National Statement on Ethical Conduct in Research Involving Humans* to inform their decisions.

If you have any concerns of an ethical nature or complaints about the manner in which the project is conducted you may contact the Ethics Officer of the Network on (03) 6226 2764. The Executive Officer can direct participants to the relevant Chair of the committee that reviewed the research.

How do I obtain the results of the research?

The results of the research will be reported in the PhD thesis which is due for submission in 2010 at which time the researchers may be contacted for a summary of the key findings. After this a copy of the thesis will be held at the University of Tasmania library and at the Australian Digital Thesis repository.

Thank you for taking the time to read this information sheet. Kate will be in contact to ascertain your willingness to participate and to schedule an appropriate time for the interview.

Dr Rosalind Bull
Chief Investigator

Professor Judith Walker

Kathryn Squibb

Appendix K: Consent Form for Interviews.

Title of Project: Rural radiography, radiographic interpretation and disclosure of diagnosis.

1. I have read and understood the information sheet for this study.
2. The nature and possible effects of the study have been explained to me.
3. I understand that the study involves participating in an interview of approximately one hour and that this interview will be recorded. During the interview I will be asked to comment on radiographic interpretation and disclosure of diagnosis in rural radiographic practice.
4. I understand that there are no anticipated risks associated with participating in this study but that an optional debriefing session will be available following the interview.
5. I understand that all research data will be securely stored on the University of Tasmania premises for five years, and will then be destroyed.
6. Any questions that I have asked have been answered to my satisfaction.
7. I agree that research data gathered from me for the study may be published provided that I am not identified as a participant.
8. I understand that the researchers will maintain my identity as a participant in this study confidential and that any information I supply to the researcher will be used only for the purpose of the research.
9. I agree to participate in this investigation and understand that I may withdraw at any time without any effect, and if I so wish, may request that any data that I have supplied to date be withdrawn from the research.
10. I agree to the researcher contacting me again in the future if they wish to clarify any issues.

Name of Participant

Signature

Date

Statement by investigator

☐ I have explained this project and implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation.

If the investigator has not had the opportunity to talk to participants prior to them participating, the following must be ticked.

☐ The participant has received the information sheet in which my details have been provided so that participants have had the opportunity to contact me prior to them consenting to participate in this project.

Name of Investigator

Signature of Investigator

Date / /

Appendix L: Questionnaire

Project Title: Rural radiography, radiographic interpretation and disclosure of radiographic opinion.

1. In what year were you born? _____

2. Gender

(Tick the appropriate box)

- a. ☐ Male
- b. ☐ Female

3. Do you have an AIR Statement of Accreditation or registration with the MRTB of WA ?

(Tick the appropriate box)

- a. ☐ No
- b. ☐ Yes
- c. ☐ Other *(Please specify)*

4. In what year did you qualify as a radiographer? _____

5. Did you gain your radiography qualifications in Australia?

(Tick the appropriate box)

- a. ☐ Yes
- b. ☐ No \Rightarrow *(Please provide details)*

6. In what type of facility did you train / study?

(Tick the appropriate box)

- a. ☐ University - Capital City
- b. ☐ University - Regional City (urban centre population >100 000)
- c. ☐ Hospital - Capital City
- d. ☐ Hospital - Regional City (urban centre population >100 000)
- e. ☐ Hospital Rural Town (rural centre with population < 100 000)
- f. ☐ Other *(Please comment)*

7. What is your radiography qualification?

(Tick the appropriate box)

- a. ☐ Certificate
- b. ☐ Associate Diploma
- c. ☐ Diploma
- d. ☐ Degree
- e. ☐ Other (*Please comment*)

8. Do you have a post graduate qualification?

(Tick the appropriate box)

- a. ☐ No

- b. ☐ Yes

(Please provide details)

9. Where are you currently working as a radiographer?

(Tick the appropriate box)

- a. ☐ Large rural centre with population 25 000 – 99 999
- b. ☐ Small rural centre with population 10 000 – 24 999
- c. ☐ Other rural centre with population < 10 000
- d. ☐ Remote centre with population > 5 000
- e. ☐ Other remote area with population < 5 000

10. In what sector are you employed?

(Tick the appropriate box)

- a. ☐ Private
- b. ☐ Public
- c. ☐ Mostly Private, some Public
- d. ☐ Mostly Public, some Private

11. Is this the major health facility for your area?

(Tick the appropriate box)

- a. ☐ Yes

- b. ☐ No ⇒ **How long does it take to travel to the nearest health facility?**
_____ (hrs)

12. Do you live in the same community where you currently work?

(Tick the appropriate box)

a. ☐ No

(Please provide details)

b. ☐ Yes ⇒ **How long have you lived there?** _____ years

13. How many radiographers are employed at your place of work (FTE)?

14. Are you employed?

(Tick the appropriate box)

a. ☐ Full Time

b. ☐ Part Time

c. ☐ Casual

d. ☐ Other *(Please comment)*

15. Are all radiographs reported by a radiologist?

(Tick the appropriate box)

a. ☐ Yes

b. ☐ No ⇒ **Approximately what percentage of radiographs is reported by a radiologist?**

(Tick the appropriate box)

i. ☐ None *(Skip to question 17)*

ii. ☐ < 25%

iii. ☐ < 50%

iv. ☐ < 75%

v. ☐ < 100%

16. What is the usual turn around time for reporting?

(Tick the appropriate box)

- a. ☐ Almost Immediately
- b. ☐ Same day
- c. ☐ Next day
- d. ☐ Within 3 days
- e. ☐ Within 5 days
- f. ☐ Within 1 week
- g. ☐ >1 week
- h. ☐ Other (*Please comment*)

17. What factors influence the turn around time for reporting of films?

18. What is your proximity to a radiologist?

(Tick the appropriate box)

- a. ☐ On site business hours only
- b. ☐ On site business hours and then on call / teleradiology
- c. ☐ On site 24hrs
- d. ☐ Off site
- e. ☐ Off site / teleradiology
- f. ☐ Off site but visits
- g. ☐ Other (*Please specify*)

19. If a radiologist is not on site, what happens if an urgent report is required?

(Tick relevant boxes)

- a. ☐ Referring clinician consults with radiographer
- b. ☐ Patient is transferred to major centre
- c. ☐ Films couriered to radiologist
- d. ☐ Referring clinician consults with radiologist
- e. ☐ Teleradiology
- f. ☐ Referring clinician diagnoses
- g. ☐ Other (*Please comment*)

20. How often are you called upon for input into radiographic opinion?

(Tick the appropriate box)

- a. ☐ Never
- b. ☐ Monthly
- c. ☐ Weekly
- d. ☐ Daily
- e. ☐ Several times daily
- f. ☐ Other *(Please comment)*

21. Who asks for your radiographic opinion?

(Tick relevant boxes)

- a. ☐ Referring clinician
- b. ☐ Nursing staff
- c. ☐ Patient
- d. ☐ Family accompanying patient
- e. ☐ Other

(Please comment)

22. Do you have any training in radiographic interpretation?

(Tick the appropriate box)

- a. ☐ No
- b. ☐ Yes \Rightarrow *(Tick the appropriate box)*
 - i. ☐ **Formal** (post graduate qualification)

(Please comment)

- ii. ☐ **Informal** (training with radiologist and/or experience)

(Please comment)

23. Do you ever provide a patient with your radiographic opinion on the films you have produced?

(Tick the appropriate box)

a. ☐ No

b. ☐ Yes \Rightarrow **If you answered yes does it depend upon the diagnosis?**

(Tick the appropriate box)

i. ☐ No *(Please comment)*

ii. ☐ Yes *(Please comment)*

24. Do you believe radiographers should disclose their radiographic opinion to the patient?

(Tick the appropriate box)

a. ☐ No *(Please comment)*

b. ☐ Yes *(Please comment)*

25. Do you believe that you will be held medico-legally responsible for disclosing your radiographic opinion?

(Tick the appropriate box)

a. ☐ No *(Please comment)*

b. ☐ Yes (*Please comment*)

c. ☐ Don't know (*Please comment*)

26. Are you ever required to x-ray friends or members of your own family?

(*Tick the appropriate box*)

- a. ☐ Never (*Skip to question 28*)
- b. ☐ Rarely
- c. ☐ Occasionally
- d. ☐ Often

27. What issues does x-raying people that you know raise for you?

(*Please provide details*)

28. Did your training as a radiographer prepare you for rural practice?

(*Tick the appropriate box*)

- a. ☐ Yes
(*Please comment*)

b. ☐ No
(Please comment)

Thank you for taking time to complete this survey.

Appendix M: Pilot of questionnaire data

Question Number	Pilot 1	Pilot 2	Pilot 3
1*			
2*			
3	AIR SoA	AIR SoA	AIR SoA
4*			
5	Studied in Australia	Studied in Australia	Studied O/S
6	University	University & Hospital	Rural Hospital
7	Diploma & Degree	Diploma	Diploma
8	PG Medical U/S	PG Cert Communication	No PG
9	25,000-99,999	10,000 – 24,999	25,000 – 99,999
10	Public	Public	Public
11	1 hour from major health facility	¾ hr from major health facility	Major Health facility for area
12	Lives in same community	Lives in same community	Lives in same community
13	4 FTE radiographers	2.5 FTE	6 FTE
14	Full Time	Full Time	Full Time
15	All radiographs reported	All radiographs reported	All radiographs reported
16	Reports by next day	Reports by next day	Same day
17	Radiologist off site but visits	Radiologist offsite and Teleradiology	Radiologist on site then on call
18	Options a - e	Teleradiology	Teleradiology
19	Opinion sought several times a day	Opinion sought several times a day	Opinion sought weekly
20	Options a-d	All options	Referrer requests opinion
21	Informal interpretation training	Informal interpretation training	Informal interpretation training
22	Does provide opinion to patients	Does provide opinion to patients	No opinion to patient
23	No comment to patient	No comment to patient	No comment to patient
24	Medico-legally responsible for opinion	Medico-legally responsible for opinion	Medico-legally responsible for opinion
25	Occasionally X-rays family	Occasionally X-rays family	Never X-rays family
26	Often X-rays friends	Occasionally X-rays friends	Occasionally X-rays friends
27	Under prepared for non-clinical role as RR	Experience prepared for role as RR	Trained in rural setting

*data not included to ensure participant non-identification

Pilot Comment data

Survey Layout

Some questions bit ambiguous. Needing more choices to offer a better answer.

Tick appropriate boxes.

Move questions on to a separate page so it is not split.

Q21 add option of experience gained through professional working

Clarity of Survey

Some questions may need more options to make sure you get the coverage for the questions you are looking for ie: give some direction to get the responses you need for survey.

Tick the relevant boxes

Comments

Thought provoking. Good provision for comment is a plus as you gain a little extra that you may not have reckoned on.

Appendix N: Interview Guide

Profile:

Do you have a statement of accreditation from the Australian Institute of Radiography or registration with the MRTBWA?

Do you provide radiographic services to a community with a population of less than 99 000?

Gender:

Age group

Years experience

What radiographic experience do you have?

How long have you been a rural radiographer?

Where did you train?

Where are you currently working as a radiographer?

On what basis are you there?

Describe the town where you work.

How is where you trained different from where you are now working?

(Tell me about the differences between rural and metro)

Preparation:

2/3 of the respondents said that their training as a radiographer prepared them for rural practice. Were there components of your training that prepared you for rural practice?

X-ray Results:

Sometimes a radiologists report is not immediately available.

Where you work what is the impact (consequences) of a delayed radiologists report?

All the people who replied to the questionnaire said that all radiographs are reported by a radiologist; but even so a large percentage said that they are asked for their radiographic opinion.

Just under half of those that replied to the survey said that the referring clinician consults the radiographer for an urgent report when the radiologist is not on site. Where you work what happens if the referring clinician wants an urgent result?

Radiographic Opinion:

Quite a few of those that replied to the questionnaire said that they are called upon to give their radiographic opinion.

Do you find that you are asked?

How often are you called upon for input into radiographic opinion?

Who asks for your opinion? Does it change if the radiologist is on site or not?

How do you feel about being asked for your radiographic opinion?

Interpretation:

The majority of respondents to the questionnaire said they had no formal training in radiographic interpretation. How about you?

How confident do you feel in radiographic interpretation?

Did you feel prepared for your role in radiographic interpretation?

Disclosure:

Do you tell patients the results of their x rays?

What do you tell them?

How do you decide what you will reveal or won't reveal?

Are you confident in what information you should disclose?

What do you believe a rural radiographer's role be in disclosure of radiographic opinion should be?

Do you think you should give results (to medical staff, to the patient, to the patients' family)?

Under what circumstances might you give people results?

What would be an example of this?

What issues do you believe surround disclosure of radiographic opinion?

Does anything change this (if you know or don't know the patient, if the diagnosis is 'all clear' or 'bad')?

What key skills do you believe a rural radiographers needs?

How would these best be achieved?

Anything you care to add? or

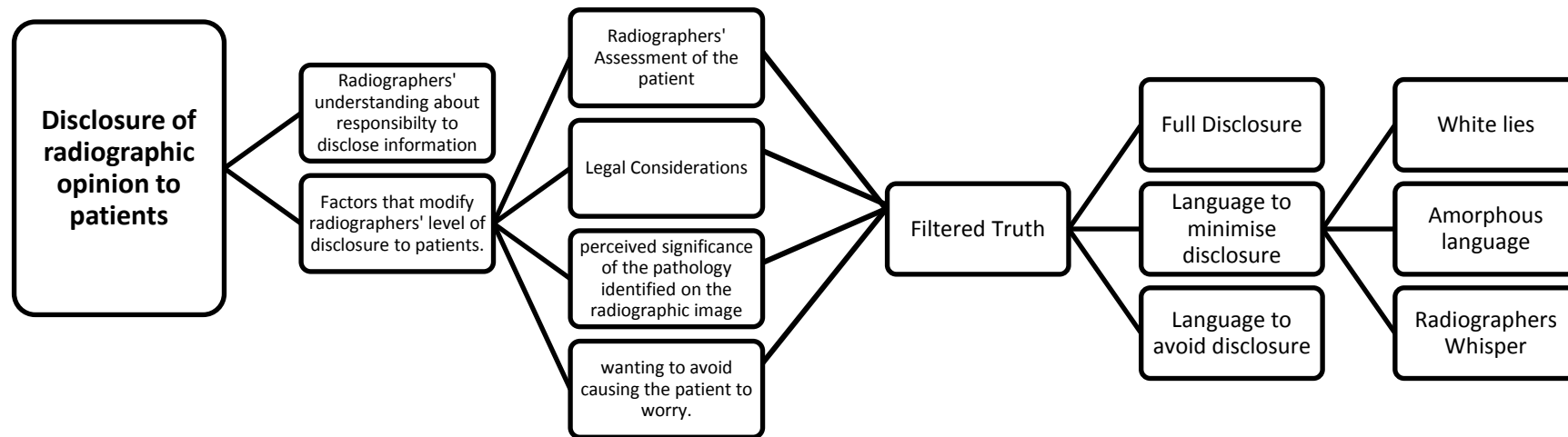
What should I have asked you that I didn't think to ask?

Appendix O: Phases of Thematic analysis

Phases of thematic analysis	Description of the process of thematic analysis
1. Familiarizing yourself with your data:	Read and re-read the data, noting initial ideas and transferred these ideas to the reflective journal.
2. Generating initial codes:	Systematically coded features of interest within the data across each of the interviews using NVivo 8 ® to collate data relevant to each code.
3. Searching for themes:	Collated the codes into potential themes by gathering all the coded data relevant to each of the potential themes and considering the relationships between the codes.
4. Reviewing themes:	Checked that the potential themes worked in relation to all the coded extracts and the entire data set. Generated a thematic table of the analysis.
5. Defining and naming themes:	Generated clear definitions and appropriate names that captured the essence of each theme. Reviewed the analysis to refine each theme. Determined the overall story of the analysis.
6. Producing the report:	The final check of analysis. Selected vivid and compelling extracts from the data as examples. Reviewed the analysis of the selected extracts and related the analysis back to the research question and the literature. Produced the findings chapters for the thesis.

Adapted from (Braun and Clarke, 2006, p. 87).

Appendix P: Flowchart: Key theme Disclosure of radiographic opinion to patient



Appendix Q: Venn diagram of relationship between key themes

