CORE COMPETENCIES OF RADIOGRAPHERS WORKING IN RURAL AREAS OF SOUTH AFRICA

by

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Dedications

This thesis is dedicated to my lovely wife Febby and my two daughters for their undivided support and belief in me. To you my queens a big thank you.

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Student number: 3733-513-8

DECLARATION

I declare that ***CORE COMPETENCIES OF RADIOGRAPHERS WORKING IN RURAL AREAS OF SOUTH AFRICA*** is my own work and all the sources that I have used or quoted have been indicated and acknowledged by means of complete references and that this work has not been submitted before for any other degree at any other institution.

…… **……**

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ABSTRACT

The contribution of general diagnostic imaging in the diagnosis and clinical management of patients in rural hospitals of South Africa is enormous. To provide high quality diagnostic imaging services for specific contexts requires radiographers who have up-to-date skills and expertise. Thus, rural radiographers require, over and above traditional radiographic expertise, additional competencies which are unique to rural practice. To date, however, little is known about additional core competencies and skills needed by radiographers working in rural areas. Previous studies have focused more attention primarily on other rural health professionals such as doctors and nurses.

The aim of this mixed methods study was to investigate and identify additional core competencies required by radiographers working in rural district hospitals of KZN in order to propose a CPD strategy aimed at rural radiographers.

An exploratory sequential design was utilised. There were seven participants in the qualitative phase of the study. In the quantitative phase a convenient sample of 109 respondents was surveyed using a structured questionnaire. Three major themes and seven categories emerged from Phase I of the study. These themes and categories were then used to develop a data collection instrument for Phase II of the study.

Collectively, the findings of this mixed methods research revealed that there were a number of additional core competencies such as, but not limited to, teamwork, ability

to do basic obstetric ultrasound scans, leadership, management, attitude and behaviours, and reporting on plain x-ray films, all of which are required by rural radiographers. Supporting evidence from the study indicated that the majority of these competencies were either partially or not at all covered in the audited curriculum. The study further revealed that the audited curriculum and the scope of radiography in its current form appear to focus attention on minimum competencies that do not promote the expansion and extension of the role of radiographers in rural areas. The study results also revealed a number of challenges faced by rural radiographers.

Key words

Competency; core competencies; rural radiography; radiographer; CPD activities; curriculum, rural areas, CPD strategy. Imaging

Table of contents **Page**

Chapter 1

Orientation to the study

1.1	INTRODUCTION	1
1.2	THE RESEARCH PROBLEM	3
1.2.1	Background to the problem	3
1.2.1.1	*Overview of radiographic imaging*	3
1.2.1.2	*Core competencies*	4
1.2.1.3	*National policies on radiographic imaging*	5
1.2.1.4	*Radiographer and the practice of rural radiography*	6
1.2.1.5	*Continuing professional development (CPD)*	8
1.2.2	Sources of the research problem	9
1.2.2.1	*Observation by the researcher*	11
1.2.2.2	*Organisation of radiography in rural hospitals*	12
1.3	PROBLEM STATEMENT	13
1.4	PURPOSE, AIM AND OBJECTIVES OF THE STUDY	14
1.4.1	Purpose of the study	14
1.4.2	Aim of the study	15
1.4.3	Objectives of the study	15
1.5	SIGNIFICANCE	15
1.6	DEFINITION OF KEY CONCEPTS	17
1.7	STUDY FOUNDATION	18
1.7.1	Philosophical paradigm	19
1.7.2	Theoretical framework	19
1.8	OVERVIEW OF RESEARCH DESIGN AND METHODOLOY	22
1.8.1	Research design	22
1.8.2	Study population	23
1.8.3	Sampling and sample size	23
1.8.4	Data collection	24
1.8.5	Data analysis	24
1.8.6	Research setting	24
1.9.	ETHICAL CONSIDERATION	25

1.10.	SCOPE AND LIMITATIONS	25
1.11	MIXED METHODS THESIS PRESENTATION	25
1.11.1	Structure of the thesis (Integrated model)	26
1.12	CONCLUSION	26

Chapter 2

Literature review

2.1	INTRODUCTION	27
2.2	PURPOSE OF THE LITERATURE REVIEW	27
2.2.1	Scope of literature review	28
2.3	RADIOGRAPHY IN SOUTH AFRICA	28
2.3.1	The concept of radiography	28
2.3.2	History of radiography in South Africa	29
2.3.3	Scope of radiography practice	29
2.4	DISTRICT HEALTH SYSTEM	31
2.4.1	Brief global perspective of 'rural'	33
2.4.2	Rural district hospital	35
2.4.2.1	*Introduction*	35
2.4.2.2	*Challenges faced by rural District Hospitals*	35
2.4.2.3	*X-ray services in South Africa's rural district hospitals*	36
2.4.2.4	*Radiographic imaging in rural district hospitals of KZN*	37
2.4.2.5	*Number of radiographers working in rural areas*	38
2.4.2.6	*The practice of rural radiography*	39
2.4.2.7	*Quality of rural radiographic services*	41
2.5	THE NEED FOR A FRAMEWORK	43
2.5.1	Conceptual framework in mixed methods research	43
2.5.2	The CNO's conceptual framework	44
2.5.3	Conceptual model of rural and remote allied health competency area	47
2.5.3.1	*Generic competency*	48
2.5.3.2	*Professional competency*	49
2.5.3.3	*Technical competency*	49
2.5.4	Development of a competency framework	49

2.5.4.1 *The Rural Radiographers Competency Framework (RRCF)* 52
2.6 GLOBAL PERSPECTIVE OF COMPETENCY 53
2.6.1 The Conceptualisation of competency 53
2.6.1.1 *The competency movement* 54
2.6.2 The use of the concept of competency in healthcare 55
2.6.3 Competencies for rural health workforce 56
2.7 SOME OF THE CORE COMPETENCIES THAT MAY BE REQUIRED FOR RURAL RADIOGRAPHERS 59
2.7.1 Technical skills 60
2.7.2 Clinical skills 62
2.7.3 Clinical Management 62
2.7.3.1 *Patient-centered radiography practice* 62
2.7.3.2 *Evidenced-based practice* 63
2.7.3.4 *Interpretation of x-ray images and other skills needed by radiographers* 65
2.7.4 Teamwork and collaborations 66
2.7.5 Problem solving skills 68
2.7.6 Critical thinking 68
2.7.7 Reflective thinking 69
2.7.8 Ethical and legal aspect of rural radiography 69
2.7.8.1 *Informed consent* 70
2.7.8.2 *Confidentiality* 71
2.7.8.3 *Performing duties that are not traditionally performed by radiographers* 72
2.7.9 Rural radiography and leadership 73
2.7.10 Management of rural radiography in rural context 74
2.7.11 Communication and information management 77
2.7.12 Personal characteristics and behaviours of individual radiographers 79
2.7.12.1 *Maintaining personal and professional boundaries* 79
2.7.12.2 *Accepting responsibilities* 80
2.8 COMMITMENT TO CONTINOUS PROFESSIONAL DEVELOPMENT (CPD) BY RURAL RADIOGRAPHERS 80
2.8.1 Health Professionals Council of South Africa (HPCSA) 80
2.8.2 Rationale for CPD 81

2.8.3	Awareness of CPD activities	82
2.8.4	CPD activities on offer	82
2.8.5	Barriers to CPD engagement by rural radiographers	83
2.8.5.1	*Frustrations*	84
2.8.5.2	*Workload and time constraint*	84
2.8.5.3	*Radiographers' attitude towards CPD*	85
2.9	TRAINING OF RADIOGRAPHERS	86
2.9.1	The concept of curriculum	86
2.9.1.1	*Radiography curriculum in South Africa*	86
2.9.1.2	*Qualifications of South the African radiographers*	87
2.9.1.3	*Curriculum changes for training of South African radiographers after 1994*	89
2.9.3	Community service	91
2.9.3.1	*Preparation of radiographers for community service placement*	92
	CONCLUSION	92

Chapter 3

Research Methodology

3.1	INTRODUCTION	94
3.1.1	Objectives of the study	94
3.2	EPISTEMOLOGICAL ASSUMPTION	95
3.2.1	Philosophical assumptions	95
3.2.2	Mixed methods research	96
3.3	RESEARCH DESIGN	97
3.3.1	Mixed methods design	98
3.3.2	Exploratory or sequential design	99
3.3.2.1	*Advantages of exploratory sequential design*	100
3.3.2.2	*Disadvantages of exploratory sequential design*	101
3.4	PROCEDURES FOLLOWED AND DEVELOPMENT OF THE INSTRUMENTS	102
3.4.1	Study population and sample selection	104
3.4.2	Sampling in exploratory sequential design	104
3.4.3	Sample size in exploratory sequential design	105
3.4.4	Inclusion and exclusion criteria of participants	105

3.4.5	Data collection in exploratory sequential design	105
3.4.6	Validity of exploratory sequential design	106
3.4.7	Approach to data analysis in exploratory sequential design	108
3.5	RESEARCH METHODS FOR DIFFERENT PHASES	108
3.5.1	Phase I: Qualitative approach	109
3.5.2	Phase I: Focus group	110
3.5.2.1	*Advantages of focus group interviews*	111
3.5.2.2	*Disadvantages of focus group interviews*	111
3.5.3	Phase I: Sampling method for focus group participants	112
3.5.3.1	*Phase I: Inclusion and exclusion criteria*	113
3.5.4	Phase I: The process of data collection	113
3.5.4.1	Invitations of focus group participants	113
3.5.4.2	Location for interviews	113
3.5.4.3	*Interview process*	114
3.5.5	Qualitative data analysis	115
3.5.5.1	*Qualitative data coding*	116
3.5.6	Trustworthiness	116
3.5.6.1	*Credibility*	117
3.5.6.2	*Dependability*	118
3.5.6.3	*Confirmability*	118
3.5.6.4	*Transferability*	119
3.6	LAST PART OF PHASE I: SURVEY INSTRUMENT DEVELOPMENT	119
3.7	Phase II: Quantitative approach	120
3.7.1	Descriptive survey	120
3.7.1.1	*Advantages of a descriptive survey*	120
3.7.1.2	*Disadvantages of survey*	121
3.7.2	Phase II: Study population	122
3.7.2.1	Phase II: Sampling method	122
3.7.2.1.1	*Advantages of census sampling*	122
3.7.2.1.2	*Disadvantages of census sampling*	123
3.7.2.2	Phase II: Sample size	123

3.7.2.3	Inclusion criteria for Phase II respondents	123
3.7.2.4	Exclusion criteria for Phase II respondents	124
3.7.3	Phase II: Data collection	124
3.7.3.1	*Likert items*	124
3.7.3.2	*Advantages of a structured data collection instrument*	125
3.7.3.3	*Disadvantages of a structured questionnaire*	126
3.7.3.4	*Curriculum audit instrument*	126
3.7.3.5	*Development of CPD proposed strategy*	126
3.7.3.6	*The questionnaire*	127
3.7.3.6.1	*Questionnaire language*	127
3.7.4	Phase II: Administration of data collection instrument	128
3.7.4.1	*Advantages and disadvantages of postal questionnaire*	128
3.7.5	Phase II: Measures to ensure validity and reliability	128
3.7.5.1	*Validity*	128
3.7.5.2	*Content validity*	129
3.7.5.3	*Face validity*	130
3.7.5.4	*Reliability*	130
3.7.5.5	*Acceptability*	131
3.7.6	Phase II: Data analysis	131
3.7.6.1	*Data coding and data entry*	132
3.7.6.2	*Data cleaning*	132
3.8	ETHICAL CONSIDERATION	132
3.8.1	Permission to conduct the study	133
3.8.2	Participants consent	133
3.8.3	Justice	134
3.8.4	Autonomy	134
3.8.5	Beneficence	134
3.9	CONCLUSION	135

Chapter 4

Data analysis, presentation and discussion for Phase I

4.1	INTRODUCATION	136
4.2	ANALYSIS, RESULTS AND DISCUSION OF THE QUALITATIVE DATA	136

4.2.1	Demographic characteristics of focus group participants	138
4.2.2	Focus group interviews	138
4.2.3	Theme 1: The environment in which rural radiographers practice radiography	139
4.2.3.1	Category: Inappropriate use of x-rays	141
4.2.3.1.1	*Subcategory: Lack of properly organisation of x-ray services in rural areas*	141
4.2.3.1.2	*Subcategory: Requesting of x-ray examinations in rural hospitals*	142
4.2.3.1.3	*Subcategory: Patients demand for x-ray examinations*	143
4.2.3.2	Category: Teamwork	143
4.2.3.2.1	*Subcategory: Radiographers' role in the rural healthcare team*	144
4.2.3.2.2	*Subcategory: Doctors do not follow procedures*	145
4.2.3.3	Category: Attitude and behaviours	146
4.2.3.3.1	*Subcategory: Respect between radiographers and other rural healthcare professionals*	146
4.2.3.3.2	*Subcategory: Showing respect and having patience for rural patients' cultural beliefs*	147
4.2.3.4	*Category: Communication in rural radiographic practice*	148
4.2.3.4.1	*Subcategory: Communication between radiographers and rural patients*	148
4.2.3.4.2	*Communication between radiographers and other healthcare Professionals*	149
4.2.3.5	*Category: Outreach programme*	150
4.2.3.5.1	*Subcategory: Introducing outreach programme for diagnostic imaging*	150
4.2.3.5.2	*Subcategory: Health information*	151
4.2.3.6	*Category: Differences between rural and urban practice*	152
4.2.3.6.1	*Subcategory: No modern equipment*	152
4.2.3.6.2	*Subcategory: Doctors seeking the opinion of radiographers on x-ray images*	153
4.2.3.6.3	*Subcategory: Routing or boring work as part of rural*	154
4.2.3.6.4	*Subcategory: No specialists in rural hospitals*	154
4.2.3.7	*Category: Challenges encountered by radiographers practicing in rural KZN*	155

4.2.3.7.1 *Subcategory: Lack of appropriate competencies* 155
4.2.3.7.2 *Subcategory: Lack of proper staff orientation* 156
4.2.3.7.3 *Subcategory: Out-dated equipment* 157
4.2.3.7.4 *Subcategory: Lack of appreciation for radiographers' role* 157
4.2.3.7.5 *Subcategory: Need for representation of radiography in broader management* 158
4.2.4 Theme 2: Radiography training and rural practice 159
4.2.4.1 *Category: Rural radiography practice* 159
4.2.4.1.1 *Subcategory: Appropriateness of curriculum for rural practice* 160
4.2.4.1.2 *Subcategory: Darkroom techniques* 160
4.2.4.1.3 *Subcategory: Need for short courses* 161
4.2.4.2 *Category: Scope of radiography in rural practice* 162
4.2.4.2.1 *Subcategory: Clinical assessment of the affected part* 162
4.2.4.2.2 *Subcategory: Basic obstetric ultrasound scanning* 163
4.2.4.2.3 *Subcategory: Radiographers doing ECG* 165
4.2.4.2.4 *Subcategory: Rural radiography and leadership skills* 165
4.2.4.2.5 *Subcategory: Rural radiography and management skills* 166
4.2.4.2.6 *Subcategory: Rural radiographers' managers work like generalists* 167
4.2.5 Theme 3: Views of rural radiographers on CPD as a lifelong learning concept 167
4.2.5.1 *Category: CPD activities and rural radiography practice* 168
4.2.5.1.1 *Subcategory: Relevance of CPD activities to rural radiography practice* 168
4.2.5.1.2 *Subcategory: Localising CPD activities* 169
4.2.5.2 Category: Barriers to CPD activities for rural radiographers 170
4.2.5.2.1 *Subcategory: Accessibility of CPD seminars* 170
4.2.5.2.2 *Subcategory: Attitude of radiographers towards CPD* 170
4.2.5.2.3 *Subcategory: Lack of logistical support by hospitals* 171
4.3 CONCLUSION 172

Chapter 5

Data analysis, interpretation and presentation of findings of Phase II of the study

5.1	INTRODUCTION	173
5.2	DATA ANALYSIS PROCESS	173
5.2.1	Questionnaire distribution and the response rate	174
5.2.2	Structured questions	175
5.2.2.1	*Section 1 of the questionnaire*	175
5.2.2.2	*Section 2 of the questionnaire*	175
5.2.2.3	*Subsection 2.1 of the questionnaire*	176
5.2.2.4	*Section 3 of the questionnaire*	176
5.2.2.5	*Section 4 of the questionnaire*	176
5.2.3	Open-ended questions	177
5.3	RESPONDENT'S BIOGRAPHICAL CHARACTERISTICS	177
5.3.1	Section 1 Item 1: Respondents' gender	177
5.3.2	Section 1 Item 2: Respondents' rank	178
5.3.3	Section 1 Item 3: Respondents' highest qualification	179
5.3.4	Section 1 Item 4: Respondents' work experience	180
5.4	THE ENVIROMENT IN WHICH RURAL RADIOGRAPHERS PRATICE RADIOGRAPHY	181
5.4.1	Item 5: Organisation of health services in the rural areas	182
5.4.2	Item 6: Request of unnecessary x-rays by rural doctors	182
5.4.3	Item 7: Rural doctors asking for the opinion of radiographers on x-rays	183
5.4.4	Item 8: Rural patients demand to be x-rayed	183
5.4.5	Item 9: The modernity of equipment in rural hospitals	184
5.4.6	Item 10: Absence of specialists (radiologists) in rural hospitals	184
5.4.7	Item 11: Rural radiography practice more boring than urban radiography practice	185
5.4.8	Item 12: Appropriate competencies to provide imaging services for PHC	185
5.4.9	Item 13: Rural radiographers' role in management of patients	186
5.4.10	Item 14: Representation of radiographers in broader management	187

5.4.11	Item 15 (a): Issues or challenges encountered in rural radiography	187
5.5	SOME OF THE COMPETENCIES THAT MAY BE REQUIRED BY RURAL RADIOGRAPHERS	189
5.5.1	Internal consistency of the eight constructs/competency areas related to radiography	190
5.5.2	Construct A: Teamwork in rural healthcare	192
5.5.3	Construct B: Attitude and behaviours for rural radiographers	193
5.5.4	Construct C: Communication in rural radiography	195
5.5.5	Construct D: Rural radiography and leadership	197
5.5.5.1	*Item 20: Some of the barriers to being a good rural radiography leader*	198
5.5.6	Construct E: Rural radiography and management	199
5.5.7	Construct F: Ethical practice in rural radiography	201
5.6	RELATIONSHIP BETWEEN RESPONDENTS' DEMOGRAPHIC VARIABLES AND THE SIX CONSTRUCTS RELATED TO CORE COMPETENCIES	202
5.6.1	Relationship between the respondents' gender and attitudes and behaviours required by rural radiographers	203
5.6.2	Relationship between respondents' gender and rural radiographers' leadership abilities	204
5.6.3	Respondents' current post and rural radiographers' leadership Abilities	204
5.7	SECTION 3: RADIOGRAPHY TRAINING AND RURAL RADIOGRAPHY	205
5.7.1	Construct A: Radiography training	206
5.7.2	Item 34: Skills and values that should have been included in the radiography curriculum	207
5.7.3	Rural radiography practice	208
5.7.3.1	*Item 35: Ability to do basic clinical assessment of patients' affected area*	208
5.7.3.2	*Item 36: Ability to perform basic obstetrics and gynaecology ultrasound scans*	209
5.7.3.3	*Item 37: Perform basic abdominal ultrasound scan*	210

5.7.3.4	*Item 38: Radiographers asked to do ECG in some rural Hospitals*	210
5.7.3.5	*Item 39: Introduction of imaging outreach services to clinics*	211
5.7.3.6	*Item 40: Outreach services used for dissemination of information about x-rays*	211
5.7.3.7	*Item 41: Scope of practice for diagnostic radiographers*	212
5.7.3.8	*Item 42: Tasks done by radiographers in rural areas but not part of the scope of radiography*	213
5.8	CPD ACTIVITIES AND RURAL RADIOGRAPHY	214
5.8.1	Construct A: Role and meaning of CPD in rural radiography practice	214
5.8.2	Barriers to CPD	216
5.8.2.1	*Item 48: Hospital providing necessary support for CPD*	216
5.8.2.2	*Item 49: Distance and attendance of CPD seminars/workshops*	217
5.8.2.3	*Item 50: Shortage of staff influence attendance of CPD seminars*	217
5.8.2.4	*Item 51: Topics covered in current CPD seminars influence attendance*	218
5.8.2.5	*Item 52: Lack of rural hospitals support for radiographers to attend activities*	218
5.8.3	Section C: Suggestions that may be included into CPD strategy proposal	219
5.8.3.1	Item 57: Topics that may be included in future CPD activities/seminars	220
5.9	Item 58: Factors that differentiate rural radiographic practice from urban practice	221
5.10	Item 59: Three important tasks performed on regular basis in rural hospital	222
5.11	CONCLUSION	223

Chapter 6

Curriculum audit and the development of CPD strategy proposal

6.1	INTRODUCATION	224
6.2	Curriculum	224
6.2.1	Purpose of curriculum audit	225
6.2.2	Sample document	225
6.2.3	Methodology for auditing the curriculum	226
6.2.3.1	*Procedure*	226
6.2.3.2	*Audit instrument*	226
6.2.4	Results of the curriculum audit	227
6.2.4.1	*Curriculum response to the needs of rural radiographic practice*	229
6.2.4.2	*Communication in rural radiography*	229
6.2.4.3	*Management in rural radiography*	229
6.2.4.4	*Basic reporting on plain x-ray films*	230
6.2.4.5	*Other skills/competencies*	231
6.2.4.6	*Lifelong learning-CPD*	232
6.3	DISCUSSION ON AUDITED CURRICULUM	232
6.3.1	Conclusion on the audited curriculum	238
6.4	THE CPD STRATEGY	238
6.4.1	Procedure followed in developing the CPD strategy	239
6.4.1.1	*Step 1: Objectives of the CPD strategy*	240
6.4.1.2	*Step2: Evidence from the study results of Phase I and Phase II*	240
6.4.1.2.1	*Barriers to CPD activities in rural areas*	242
6.4.1.2.2	*Suggestions to be considered during the development of a CPD strategy*	243
6.4.1.3	*Step 3: Identified areas to be included in the CPD strategy*	244
6.4.1.4	*Step 4: Draft CPD strategy and the validation process*	244
6.4.2	Feedback from evaluators	245
6.5	THE FINAL CPD STRATEGY PROPOSAL	247
6.5.1	Structure of the CPD strategy	248
6.5.1.1	*Step 1: Purpose of the CPD strategy*	249

6.5.1.2	*Step 2: CPD activities required by rural radiographers*	249
6.5.1.3	*Step 3: Develop appropriate and relevant CPD activities*	250
6.5.1.4	*Step 4: Accreditation of CPD activities*	251
6.5.1.5	*Step 5: Identify geographically accessible CPD venues*	251
6.5.1.6	*Step 6: Implementation of the CPD strategy*	251
6.5.1.7	*Step 7: Evaluation of outcomes and feedback*	252
6.5.2	Subdomains of the CPD structure	252
6.5.2.1	*Participation of relevant stakeholders*	252
6.5.2.2	*Local CPD programme coordinators*	253
6.5.2.3	*Sustainability of the strategy*	254
6.5.2.4	*Success of the CPD strategy*	254
6.6	REFLECTION AND CONCLUSION ON THE CPD STRATEGY	255
6.6.1	Reflection	255
6.6.2	Conclusion on CPD strategy	255
6.7	CONCLUSION ON CHAPTER 6	255

Chapter 7

DISCUSSIONS, LIMITATIONS AND RECOMMENDATIONS

7.1	Introduction	257
7.2	THE STUDY FINDINGS	258
7.2.1	Additional competencies required by rural radiographers	258
7.2.1.1	*Ability to work in a multi-disciplinary team*	259
7.2.1.2	*Attitudes and behaviours for rural radiographers*	259
7.2.1.3	*Communication in rural areas*	260
7.2.1.4	*Rural radiography and leadership*	260
7.2.1.5	*Rural radiography and management*	261
7.2.1.6	*Ethics in rural radiography*	261
7.2.2	Appropriate competencies for radiographers to support PHC	261
7.2.2.1	*Clinical skills: Ability to do basic assessment of the patients' affected area*	262
7.2.2.2	*Clinical skills: Interpretation of plain x-ray films*	262
7.2.2.3	*Clinical skills: Ultrasound scanning by diagnostic radiographers*	263

7.2.2.4	*Introduction of outreach programme*	264
7.2.3	Challenges encountered in rural radiographic practice	265
7.2.3.1	*Scope of radiography practice*	266
7.2.4	Radiography training and rural practice	267
7.2.5	The difference between rural radiography practice and urban practice	268
7.3	REFLECTION ON THE STUDY	269
7.4	POLICY IMPLICATIONS	270
7.5	LIMITATIONS OF THE STUDY	270
7.5.1	Objectivity of this study	271
7.6	RECOMMENDATIONS	271
7.6.1	General	271
7.6.2	Radiography curriculum	272
7.6.3	The CPD strategy and CPD activities	273
7.6.4	Future research	274
7.7	CONTRIBUTION OF THIS STUDY	274
7.7.1	CPD strategy	274
7.7.2	The outline of competencies as a spin-off	275
7.8	CONCLUSION	275
	LIST OF REFERENCES	277

List of Tables

Table 1.1	Visual presentation of summary of the research process	23
Table 3.1	Methods followed to ensure trustworthiness	117
Table 4.1	Demographic characteristics of focus group participants (n=7)	138
Table 4.2	Theme 1: The environment in which rural radiographers practice radiography	141
Table 4.3	Theme 2: Radiography training and rural practice	159
Table 4.4	Theme 3: Views of rural radiographers on CPD as lifelong learning concept	168
Table 5.1	Organisation of health services in rural areas (n=109)	182
Table 5.2	Request of unnecessary x-rays by rural doctors (n=109)	182
Table 5.3	Rural doctors asking the opinion of radiographers on x-rays (n=109)	183
Table 5.4	Patients in rural areas demand to be x-rayed (n=109)	184
Table 5.5	The modernity of equipment in rural hospitals (n=109)	184
Table 5.6	Absence of specialists such as radiologists (n=109)	185
Table 5.7	Rural radiography practice more boring than urban (n=108)	185
Table 5.8	Appropriate competencies to provide imaging services for PHC (n=104)	186
Table 5.9	Appreciation of rural radiographers' role in management of patients (n=109)	186
Table 5.10	Representation of radiographers in broader management (n=108)	187
Table 5.11	Challenges faced by radiographers practicing rural radiography (Question 15a; N=53)	188
Table 5.12	Measures of internal consistency for all eight construct/ competency related to radiographers working in rural areas.	191
Table 5.13	Teamwork in rural healthcare	192
Table 5.14	Mean scores for responses for each statement on teamwork in rural healthcare	193
Table 5.15	Attitude and behaviours required by rural radiographers	194
Table 5.16	Mean scores for respondents' responses for each statement on attitude and behaviours needed by rural radiographers.	195

Table 5.17	Communication in rural radiographic practice	196
Table 5.18	Mean scores for respondents' responses for each statement on communication in rural radiographic practice	196
Table 5.19	Rural radiography and leadership	197
Table 5.20	Mean scores of the respondent's response for each statement related to rural radiography and leadership	198
Table 5.21	Barriers to one being a good rural radiography leader (Question 20; N=43)	199
Table 5.22	Rural radiography and management	200
Table 5.23	Mean scores for the respondents' responses for each statement regarding rural radiography and management	201
Table 5.24	Ethical practice in rural radiography	201
Table 5.25	Mean scores for' responses for each statement on ethical practice in rural radiography	202
Table 5.26	Overall level of agreement with Attitude and behaviours required by rural radiographers by gender	203
Table 5.27	Overall level of agreement with rural radiographers' leadership abilities by Gender	204
Table 5.28	Overall level of agreement with rural radiographers' leadership abilities by present job post.	204
Table 5.29	Radiography training	205
Table 5.30	Mean scores for respondents' responses for each statement on radiography training	206
Table 5.31	Skills and values that may have been included in the radiography curriculum for the benefit of rural radiographers (Question 34; N=41)	207
Table 5.32	Radiographers should have the ability to do basic clinical assessment (n=108)	209
Table 5.33	Ability to perform basic ultrasound scans (n=107)	209
Table 5.34	Perform basic abdominal ultrasound scan (n=108)	210
Table 5.35	ECG done by radiographers in some rural hospitals (n=105)	210
Table 5.36	Obstetric ultrasound services to clinics (n=108)	212
Table 5.37	Dissemination of information to the communities about x-rays	212
Table 5.38	Existing scope of practice for diagnostic radiographers	212

Table 5.39	Tasks done in rural areas but not part of the scope of radiography (Question 42; N= 30)	213
Table 5.40	Role and meaning of CPD in rural radiography practice (n=101)	215
Table 5.41	Mean score for the respondents' responses for each statement related to CPD in rural radiography practice (n=101)	216
Table 5.42	Provision of support to attend CPD seminars (n=101)	217
Table 5.43	Distance where CPD seminars hinders rural radiographers (n=101)	217
Table 5.44	Influence of shortage of the staff on the attendance of CPD seminars (n=101)	218
Table 5.45	Type of CPD topics covered influence CPD attendance (n=99)	218
Table 5.46	Rural hospitals support for radiographers to attend CPD activities (n=101)	219
Table 5.47	Suggestion for CPD strategy proposal	219
Table 5.48	Topics that may be included in future CPD activities/seminars	220
Table 5.49	Factors that make rural radiography practice different from urban practice (Question 58; N=43)	221
Table 5.50	Three most important tasks performed on regular basis in rural hospitals but not performed in urban hospitals (Question 59; N=29)	222
Table 6.1	Results from the audited curriculum	228
Table 6.2	Areas included in the CPD strategy	244
Table 6.3	Demographic information of expert evaluators of the draft CPD strategy	245
Table 6.4	Results of evaluation of draft CPD strategy by evaluators	246

List of Figures

Figure 1.1	Competency framework for rural radiographers	21
Figure 2.1	District Health System	32
Figure 2.2:	Modified South African version of the District Health System	33
Figure 2.3:	Step one of rural framework wheel	34
Figure 2.4	Conceptual frameworks for organizing competencies for RPNs	46
Figure 2.5	Conceptual model of rural and remote allied health competency area	48
Figure 2.6	Integrated steps to evidence-based practice	64
Figure 2.7	The four-tier model for the UK radiographers	75
Figure 2.8	South African version of the four-tier model	76
Figure 3.1	Diagrammatic representation of the procedures followed in this exploratory sequential research methodology	103
Figure 5.1	Respondents' gender (n=109)	177
Figure 5.2	Respondents' rank (n=109)	178
Figure 5.3	Respondents rank grade	179
Figure 5.4	Respondents' highest qualification (n=109)	180
Figure 5.5	Respondents' work experience	181
Figure 6.1	Procedure followed in the development of the CPD strategy for rural radiographers	239
Figure 6.2	Diagrammatic presentation of the CPD strategy for rural radiographers	248

List of abbreviations

AD	Assistant Director
ADR	Assistant Director Radiographer
ANOVA	Analysis of variance
CIPD	Chartered Institute of Personnel Development
CNO	College of Nurses of Ontario
CPD	Continuous Professional Development
CT	Computed Tomography
DHS	District Health System
DoH	Department of Health
EBP	Evidence Based Practice
HPCSA	Health Professions Council of South Africa
HPT	Human Performance Technology
HRH	Human Resource for Health
HRMS	Human Resource Management Services
IOM	Institute of Medicine
KZN	KwaZulu-Natal
NDoH	National Department of Health
NCS	National Core Standards
NHI	National Health Insurance
NHS	National Health Services
NQF	National Qualification Authority
OBE	Outcome Based Education
OT	Occupational Therapy
MRI	Magnetic Resonance Imaging
PHC	Primary Health Care
QA	Quality Assurance
QC	Quality Control
RCT	Radiography and Clinical Technologist
RPN	Registered Professional Nurse
RRCF	Rural Radiographers Competency Framework
SAQA	South African Qualification Authority
SCM	Supply Chain management

SoRSA	Society of Radiographers of South Africa
UNISA	University of South Africa
UNICEF	United Nations International Children's Emergency Fund
UK	United Kingdom
USA	United States of America
UYD	Umthombo Youth Development
WIL	Work Integrated Learning
WHO	World Health Organisation

CHAPTER 1

ORIENTATION TO THE STUDY

1.1 INTRODUCTION

The South African Department of Health (DoH) endevours to provide quality and comprehensive health care based on the principles of Primary Health Care (PHC) through the District Health System (DHS). The adoption of PHC as means of delivering health services to all South African citizens meant that radiological services were required to be available at all levels of healthcare namely PHC, secondary and tertiary (Thulo 2006:3). Therefore, PHC as the first point of contact for rural patients must offer a comprehensive and coordinated health care. Rural district hospitals are the first frontiers in support of PHC. These hospitals must have the capacity to effectively diagnose and treat less complicated problems and be able to promptly refer cases that need specialised management to regional hospitals.

According to Mung'omba (2011:15), for rural hospitals to offer health care which is comprehensive, it is important that patients at first level rural hospitals have access to diagnostic imaging services. It is also important that rural doctors are able to know when and how to use these services and be able to do so effectively.

In many rural hospitals general radiography remains the first choice of imaging technique (MacKay, Hancy, Crowe, D'Rozario & Ng 2012:35). Radiographers are needed to operate a radiography service and therefore radiographers as clinical support staff become an essential component of a rural health care team. These radiographers acquire core clinical and technical skills during training. However, there is a variation both in the context and the required skills in rural areas (Smith & Hays 2004:69). To provide quality healthcare services in line with the needs of the community requires a workforce that is integrated and is able to demonstrate a range of competencies that are defined by the needs of patients within a particular geographical area (National Health Services 2010:5). In a study by Maru, Schwaz, Andrews, Basu, Sharma and More (2010) it was found that there was a high morbidity among rural communities due to orthopedic trauma and diseases. Proper

clinical management according to these authors requires timely x-ray in many cases. Rural health care settings make certain demands that may not be anticipated by radiographers during the pre-service training. Ultimately, the aim of radiographers working in rural areas is to have additional context specific core competencies. Having these competencies should impact positively on rural health outcomes particularly in terms of preventing death and disability in situations where radiography can play a role in reducing waiting time. Provision of diagnostic imaging services on time is essential. According to Maru *et al* (2010) delayed diagnosis in cases such as tuberculosis, fractures and pneumonia may result in health complication which may lead to disability and even death.

The need for competent rural radiographers to deliver diagnostic radiographic services for clinical and public health in primary care is evident. Literature indicates that the majority of patients seeking routine and emergency care in these rural hospitals mainly present with complaints of chest and orthopedic problems (Maru *et al* 2010). These authors add that radiographic imaging is critical in all these conditions for diagnosis and treatment thereafter. The demands of rural radiography practice extend beyond the traditional core radiographic competencies obtained at a point of graduation. For instance, Smith, Traise and Cook (2009:2) reveal that the opinion of radiographers working in rural areas of Australia on the radiographs is actively sought and valued by requesting clinicians. In this regard the National Rural Health Association (2008:1) supports the notion that radiographers and diagnostic imaging in general are an essential component of primary care in rural areas. This group of professionals is expected to be aware of its expanded role and be prepared to respond to requests for assistance from doctors and other health workers such as physiotherapists and dentists. To this effect, the researcher argues that the practice of rural radiography make certain demands in terms of competencies that are not anticipated in the pre-service training.

According to Strasser, London and Kortenbout (2005:134) the policy document of the DoH which dealt with the shift towards DHS based on PHC called for retraining and reorienting of all health workers including radiographers. Since radiographers are involved in the rural healthcare, it is important that they continue to be active in the reshaping of rural radiographic service, their role and their destiny. Yet

radiographers working in rural areas appear to lack some of the additional core competencies that are aligned with the rural environment and are essential for effective performance in rural setting. The uncertainty regarding rural radiographers' professional role and additional core competencies needed has somehow disillusioned many rural radiographers. While some competencies for other rural healthcare professionals maybe applicable to some degree (Sutherland & Chur-Hansen 2014:274), there has been no investigation on the competencies in the context of radiographers working in rural areas of South Africa. Regardless of this situation there is potential in identifying additional core competencies that may allow for increased effectiveness of rural radiographers (Lin, Beattle, Spitz & Ellis 2009).

1.2 THE RESEARCH PROBLEM

1.2.1 Background to the problem

This section focuses on the background to the problem. The researcher begins by briefly discussing an overview of diagnostic radiographic imaging.

1.2.1.1 Overview of radiographic imaging

Since the discovery of x-rays by a Germany scientist, called Wilhelm Conrad Röntgen, in November 1895, diagnostic imaging has become a major component of modern medicine. It is now used for both therapeutic and diagnostic purposes and literature indicates that its use for medical purposes continues to grow (Ratnapalan, Bentur and Koren 2008:1293). The benefits of diagnostic imaging to the patient in terms of comfort, diagnostic and therapeutic effectives cannot be overemphasized (Tavakoli Seilanian & Saadatjou 2003:3). There has been a notable increase in the utilisation of diagnostic imaging service over the years. Yet Government on the other hand as the major provider of public health care resources is demanding an accounting of the value received by patients for the millions of rand it spends. With the current rising health care cost some researchers have argued that health care resources must be used judiciously by taking into consideration the benefit, risks and cost (Verna, Vasudevan, Jinnur, Nallgatha, Majamdar, Arjomand, & Rominick, 2011:286). This can only be achieved if the workforce behind the delivery of

diagnostic imaging is repositioned and aligned to the demands of their respective communities. The repositioning of radiographers working in rural areas of South Africa may be linked to the identification and development of additional core competencies. The context specific competencies which may not have been acquired at a point of graduation could be achieved through a Continuing Professional Development (CPD) strategy that is deliberately designed to meet the unmet competency needs of rural radiographers.

1.2.1.2 Core competencies

Hoffman (1999:275) argues that there is no single definition for the term ‘‘competency’’ but rather it is a multifaceted concept. This author says competency derives its’ definition from the rationale for which its use has been shaped. Therefore, competencies, Hoffman (1999:275) argues may be defined as behaviour that an individual needs to demonstrate and or minimum standards of performance. It could mean that with differences in the complexity and broadness of tasks expected from radiographers in rural settings compared with tasks of radiographers operating in urban hospitals the required core competencies may not necessarily be the same.

The difference between the rural working environment and the urban setting was noted in the Australian study by Bent (1999:203). He pointed out that doctors in rural hospitals may seek radiographers’ opinion regarding the diagnosis as reflected on the X-ray whereas in urban settings the radiologist’s opinion is sought instead. If the radiographer working in the rural setting is not qualified to give an opinion, it may affect the radiographer’s confidence and consequently his/her relationship with other clinicians that asked for his opinion. To this effect, Lin, *et al* (2009) suggest that health professionals working in rural areas require unique skills. This, according to Walkerman (2004:210), is likely to confer appropriate recognition for the radiography practitioners in rural areas and they will be able to distinguish their practice from that of their counterparts in urban health care centres.

In another study it was pointed out that competencies of radiographers in rural radiography practice have a direct influence on the health care and safety of those

patients (Axley 2008:214). This reflects on the need to emphasize the importance of attainment and maintenance of competencies that are required by radiographers working in rural hospital settings. With other health professions, such as nursing, authors have long advocated the importance of changing the paradigm to a stage of continuing competency development as opposed to just demonstrating competency (Ironside 2008:92).

1.2.1.3 National legislation and policies on radiographic imaging

In terms of the legal framework, the Health Professions Act No.56 of 1974 describes who is considered as a healthcare professional (Etheredge 2011:9). According to this Act, a healthcare professional practicing such a profession need to be registered with the Health Professions Council of South Africa (HPCSA). Therefore, in terms of this Act radiographers are considered as healthcare professionals and require registration with HPCSA (Etheredge 2011:10).

The current minimum training requirement for a radiographer to register with the Health Professions Council of South Africa is a three-year national diploma (HPCSA 2013). The first registration after completion of the educational requirements is under the category; public service: community service (HPCSA 2013). Annexure 10 of Act No. 56 of 1974 of the Health Professions and as amended by government notice No.68 of 2 February 2009 states that a radiographer shall not in his/her practice exceed the limits of the category in which he/she is registered (The South African Government 2006). This constitutes a legal framework within which radiographers need to practice radiography in South Africa. Furthermore, healthcare professionals are required to maintain a consistent and ongoing commitment to lifelong learning (HPCSA 2011:14). To this effect Act No. 56 of 1974 as amended makes it a legal requirement and endorses CPD as a means by which health professionals can maintain and update professional competency (HPCSA 2011:4).

It was pointed out earlier that diagnostic imaging is one of the major components of modern medicine. Literature published by the World Health Organisation (WHO) reveals that even though there may be no reliable documentation, it is assumed that clinical assessments and investigations alone may not be sufficient to arrive at the

correct diagnosis in about 20% - 30% of cases worldwide (WHO [Sa]:1). This justifies the need for diagnostic tests which can either be diagnostic imaging or laboratory investigations in rural hospitals. Despite the enormous contribution of diagnostic imaging towards patient care, policies and guidelines in particular those targeted at rural radiographers competencies, are largely missing in most developing countries (WHO [Sa]:3). In the context of South Africa there is legislation for radiography in general (Etheredge 2011:9; The Government of South Africa 2006)

Evidence from literature suggests that where policies and guidelines are in place structure and uniformity is assured and consequently reduces the number of x-rays that may be unhelpful and or specify requirements for these services (Dhinga, Finlay, Robinson & Liddicoat 2002:862).

1.2.1.4 Radiographer and the practice of rural radiography

PHC comprises eight elements and element number eight provides for appropriate treatment of common diseases and injuries (WHO 2008:5). Radiographers working in rural hospitals contribute towards appropriate treatment of diseases and injuries through diagnostic imaging. The work of rural radiographers is crucial to ensure that the diagnostic images they produce and their interpretations are accurate and reliable. However, the scope of radiographic practice in rural hospitals has never been debated or clarified and as such the problems that are encountered have never been addressed. The study conducted by Gqweta (2012:25) found that there was failure by radiography training institutions to fully prepare radiographers for challenges encountered in PHC. It must however be noted that the study was conducted at PHC clinics in urban and not rural settings. But even there, away from big hospitals, the evidence suggests that competencies required by radiographers in PHC may be different.

Other than the clinical radiographic practice that rural radiographers need to do, Boulle (1997:6) suggest that rural health practitioners require skills that may not necessary be part of the traditional scope. For instance, Smith and Hays (2004:69) noted that the scope of practice for doctors in rural areas may be extended to encompass that of specialists. Similarly, required competencies for rural

radiographers may overlap between other rural health disciplines. To this effect, re-engineering of the healthcare professionals to meet service requirements has been identified as one of the eight thematic priorities in the 2012/13-2016/17 Health Resources for Health strategy (DoH 2011:73). However, lack of clarification regarding the scope or radiography somehow impacts negatively on the professional development of those radiographers working in rural areas. By identifying additional core competencies required by this professional group, it may be possible to advance and enhance their professional needs.

In many instances practicing radiography in rural settings entails different ways of communication and added responsibilities. For example, confidentiality is an important aspect of healthcare, but in the context of rural settings confidentiality is further impacted by social relations for both patients and healthcare professionals (Bourke, Sheridan, Russell, Jones, De Witt & Liaw 2004:182). To this effect, these authors describe rural health practice as a complex web of social relations that include cultural history and social political network. However, Bourke *et al* (2004:184) suggest that understanding how this complex web impacts on healthcare professionals in rural health practice may help in improving the training of health professionals.

The demand of what is required from radiography and radiographers today puts increased pressure on both the radiographer and the hospitals that provide the service. Rural hospitals are pressured from both the government and communities to improve the quality of healthcare. With this ever present demand for quality health care, radiographers working in rural areas are required to do more (Akroyd, Legg, Jackowski & Adams 2008:114). Radiographers working in rural hospitals, therefore, need to be flexible in their work practices and also be innovative as there is no room for static radiography in rural hospitals. Static radiography refers to a situation where the practitioner appears not embrace extra demands other than traditional radiography duties. The complexity and diverse nature of rural radiography practice and the multiplicity of rural patient needs raises the requirements on the competency of radiographers in rural diagnostic imaging departments. Similarly, Engel-Hills (2005:220a) is also of the view that other than the traditional core radiographic competencies it was important for the radiography curriculum to integrate generic

competencies if it was to meet the demands of the modern work environment. However, these additional competency requirements required by rural radiographers may not have been included in the training curriculum.

1.2.1.5 Continuing professional development (CPD)

In the case of South Africa, many radiographers participate in CPD activities mainly to fulfill statutory requirements. This though is not different from the Australian radiographers where 70% who took part in the study conducted by Sholer, Tonkins, Lau, Law, Rahma and Hulket (2011:21) reported that they took part in the CPD activities in order to meet the regulatory requirements. Nevertheless, results from the same study showed that 55% of participants believed that CPD increased their professional knowledge (Sholer *et al* 2011:22).

Currently, literature reveals that the CPD has now been considered a priority within the healthcare professions around the globe (Gawugah, Jadva-Patel & Jackson 2011:332). This means that CPD is aimed at helping health professionals to maintain clinical competency and enables them to provide quality patient care. It further plays an important role in ensuring that health professional gain knowledge and skills for extended roles. In view of this, one is inclined to suggest that the importance of CPD for both radiographers and other health workers is beyond question.

Evidence from published literature suggests that CPD activities have been shown to reduce deficiencies between training and practice, hence promote the necessary knowledge and skills for continued competence for individual professional (Nalle, Wyatt & Myers 2010:108). This view is supported by Gawugah *et al* (2011:332) who note that CPD activities give health care professionals opportunities to enhance their basic knowledge and skills which result in the enhancement of individual competency. For instance, a recent study conducted in the UK by Howard (2013:140) suggested that due to shortage of radiologists in rural hospitals radiographers could take the CPD opportunity to shadow the radiologists. Therefore, the benefits that can be gained from CPD engagement by radiographers, the hospital and the radiography profession at large are numerous (Gawugah *et al* 2011:334).

Radiographers working in rural KZN hospitals are faced with an expanded skills mix which in many cases is not recognised (Cowling, 2013:91). With this complexity of rural radiographic practice, there is need to revisit the current CPD strategy with a view to redesigning it so that the strategy can respond to the needs of rural radiographers and thereby helping them to deal with rural challenges. It is however, important that rural radiographers' competency needs are first explored in order to inform current and future CPD strategy.

The development of a CPD strategy for radiographers working in rural areas is therefore likely to ensure that competencies such as attributes, skills, knowledge and behaviours needed to enable them perform are utilised effectively (Australian Institute of Radiography 2006:5). These CPD benefits can only be realized when the activities are aligned to the needs of the rural set up. For instance, published evidence suggests that appropriate and locally based CPD has been identified as one of the important factors for rural retention of health staff (Cooke, Cooper & Versteeg 2011: 114).

1.2.2 Source of the research problem

The advent of democracy in 1994 saw the transformation of the South African healthcare system towards the DHS based on the PHC (Lehmann 2008:164). In 2008 the then minister of health addressing the National Health Consultative Forum reaffirmed that PHC was the tool that must be used to strengthen the health system (DoH 2008). The importance that the South African government attaches to the transformation of health system from secondary to primary care was once again brought to the fore in 2010 when the current minister for health called for more emphasis on PHC as part of the reduction of burden of disease in the country (DoH 2010).

This shift of emphasis from secondary to primary health care by the department of health creates a new frontier on how rural radiography should operate. According to Lehmann (2008:164) at the center of this shift of the South African health care system driven by PHC was the re-orientation and re-organisation of the healthcare staff both old and new. This is echoed by Strasser, London and Kortenbout

(2005:134) who explain that the policy document on the shift towards DHS based on PHC called for retraining and reorienting of all health workers. Even though the initiative has been in place for almost 20 years not all staff, including radiographers, appear to have been properly re-oriented towards PHC. One of the notable dimensions likely to affect these rural radiographers' integration and worker performance is competency. Yet the Alma Ata declaration (September 1978) emphasized the need for re-orientation and broadening of competencies of healthcare professionals to enable them respond to the challenges of PHC (Lehmann 2008:164). Kautzky and Tollman (2008:18) writes that almost 20 years since the transformation and more than 30 years after the famous Alma Ata declaration PHC promises in South Africa remains largely unmet. Literature reveals that the transformation of the South African healthcare system has faced numerous challenges among them is the need for high quality PHC professionals (Strasser *et al* 2005: 134). To this effect this shift, without proper re-orientation, is likely to have a fundamental effect on the way radiographers working in rural hospitals organise and deliver diagnostic imaging service (Birchall 2010:101).

On the contrary, Sutherland and Chur-Hansen (2014:274) are of the view that identifying core competencies needed for rural practice may ensure that graduates, such as radiographers, are well prepared for the rural setting. It is therefore imperative for radiographers working in rural areas to have needed core competencies that will allow them to re-align themselves towards the shifting paradigm and ensure that they are included.

Presently, radiographers working in rural areas do not appear to re-align themselves in the greater rural health care delivery. They, for instance, have remained stagnant when it comes to role extension as compared to other health workers working in rural areas such as nurses. At primary and community level, for instance, there has been a delegation of prescribing and diagnosing from doctors to nurses (Lehmann 2008:172). Literature reveals that redesigning work roles is a way of maximizing staff flexibility base and thereby improving service delivery (Hardy & Snaith 2006:329). In the case of radiographers working in rural areas re designing of work roles may entail acquiring extra competencies in addition to those expected at the point of graduation and the traditional scope of radiography practice. The Australian

Institute of Radiography (2006:5) retaliates that there is evidence which confirms the value of redesigning work roles.

The foregoing section above brings to the fore that other than the core competencies acquired at the point of graduation by radiographers there was need for additional competencies needed for rural radiographic practice.

1.2.2.1 Observation by the researcher

Even with radiographers embracing the technological advancement in diagnostic, there are observable competency deficits within the community of radiographers working in rural areas of South Africa. The researcher has observed that the radiographers lack flexibility and are not multi-skilled to combine plain x-ray, ultrasound imaging and other responsibilities such as clinical management and leadership. Evidence from literature indicates that, due to the ever increasing diverse radiographic responsibilities, there is demand for radiographers to extend their scope of competency beyond those acquired at the point of graduation (Hardy & Snaith 2006:328). In the context of rural district hospitals there is limited or no standard to help radiographer practitioners to carry out their responsibilities and assess their competencies (Carrington, Weir & Smith 2010:169).

The rural working environment demands that radiographers adopt broader roles than those of their counterparts in bigger regional hospitals. Radiographers assigned to rural hospitals, mainly new graduates, are expected to carry out their duties as independent and be accountable (Tan Liang, Reed & Audera 2010:22). However, in the context of South Africa, most radiographers assigned to work in rural hospitals have less experience and they have no chance or time to progress gradually from simple to more demanding duties and from lesser responsibilities to more responsibilities. Radiographers working in rural find themselves charged with higher responsibilities regardless of their experience (Lin *et al* 2009). In an ideal set up there must be a gradual transition. During that time the junior radiographer is expected to acquire and develop necessary confidence and competencies and be able to appreciate rural radiography. In many instances rural radiography practice is often

without support structures. This is likely to aggravate the fact that many graduate radiographers lack appropriate competencies needed for rural practice (Lehman & Makhanya 2005:139). There is need thus to define and develop additional core competencies and attributes and behaviours for rural radiographic workforce according to local needs.

In some countries competencies for other rural health professional such as nurses and doctors have been developed (Sutherland & Chur-Hansen 2014:273). Contrast this with radiographers working in rural areas of South Africa whose competencies have not even been identified. It is therefore in the interest of both rural hospital management and doctors to be aware of core competencies and skills development needs that can contribute towards the delivery of dependable and cost effective diagnostic imaging by radiographers. Similarly, a study done in Australia on self-reported competency of remote x-ray operators concluded that the purpose of continuous educational development is to improve patient outcome by improving clinical practice (Smith & Fisher 2011:11).

1.2.2.2 Organisation of radiography in rural hospitals

Although radiographers working in rural hospitals are the initial contacts, in their respective x-ray units, their views on some of the basic diagnostic imaging issues appear to be ignored by both clinicians and hospital authorities. This, though, is against the fact that in the absence of radiologists, the rural district hospitals' diagnostic imaging units are manned by radiographers. This may be linked to the fact that medical imaging is medically oriented. This arrangement supports the powerbase of radiologists and devalues the role played by radiographers as an integral part of the health care team and in particular the diagnostic imaging team (McConnell & Smith 2008:5). This view however contradicts the National Core Standards (NCS) which requires that the x-ray department must be managed by a qualified radiologist or radiographer (DoH 2012:451). Other than being a platform for quality assurance, the NCS were developed to reflect what is expected from managers and staff in public health institutions (DoH 2012:3), which includes x-ray departments.

As rural district hospitals strive for models of management that are linked to their

vision and mission statements, radiographers and other health professionals found themselves required to engage in managerial roles (Jasper & Crossan 2012:839). Yet many of these radiographers assigned to rural hospitals to lead x-ray departments are either community service radiographers or radiographers with little or no work experience. They are supposed to be guided and supported by experienced radiographers to enable them acquire specific core competencies related to rural healthcare environment.

Results from a study conducted in New South Wales confirmed the need for support in order to help new graduate transition into rural practice (Lee & Mackenzie 2003:36). Unlike their counterparts in urban hospitals, most junior radiographers working in rural hospitals do not have the opportunity to be guided by a more experienced practitioners or radiologists. This is likely to affect their overall performance.

Efficiency of rural radiographers can only be achieved through sound knowledge of context specific core competencies and implementation of a CPD strategy that is targeted at this professional group with the view to improving and enhancing the quality of rural diagnostic imaging in rural public health institutions.

1.3 PROBLEM STATEMENT

The quality of diagnostic imaging in rural hospitals depends on the availability of skilled and competent radiographers. Radiographers working in rural hospitals of South Africa may therefore require additional skills, attributes and behaviours over and above those acquired through formal training in order for them to deliver diagnostic imaging service that is commensurate with the rural epidemiological and demographic demands. However, to the best knowledge of this researcher, an exploration of potential opportunities that may equip this relatively small, but important group of healthcare professionals and essential component of rural health care has not been conducted. One may contrast this with other health professional such as doctors and nurses. Historically, the majority of interventions aimed at addressing the healthcare needs of rural communities have long been focused on

doctors and nurses only (Reid & Cakwe 2011:34; National Health Services 2010:8; National Rural Health Association 2008:1). While a great deal has been done on other health professionals such as doctors and nurses, there is very little or no literature on the additional core competencies that may be required to be an effective rural radiographer.

What's more, the radiography profession is, according to Pratt (2005:22), without defined guidelines as to the nature of competency. The absence of data to benchmark the current required additional core competencies of radiographers working in rural district hospitals of KZN makes it even more difficult to realistically argue for or against redesigning their work roles. Furthermore, the limited literature on the additional context-specific competencies aligned to rural environment brings to the fore the fact that delivery of diagnostic imaging services and factors that may prohibit or enhances its utilisation by both rural doctors and patients remain complex.

There is a need to bring to the attention of healthcare teams and authorities in rural hospitals the context-specific core competencies needed by rural radiographers who deliver diagnostic imaging services. The problem is that, in the context of South Africa, these additional core competencies have not been explored, investigated and documented.

This, therefore, highlights the need for a research that should be directed at the investigation and identification of additional core competencies required by radiographers working in rural areas of South Africa.

1.4 PURPOSE, AIM AND OBJECTIVES OF THE STUDY

1.4.1 Purpose of the study

The purpose of this exploratory sequential mixed methods study was to explore and investigate additional core competencies required by radiographers working in rural areas of South Africa and propose a CPD strategy that may contribute to the continuous competency development of rural radiographers.

1.4.2 Aim of the study

The aim of this study was to investigate the additional core competencies required by radiographers working in rural district hospitals of KZN in order to propose a CPD strategy which takes into consideration the specific competency needs of their working environment.

1.4.3 Objectives of the study

The objectives of this study are to:

- investigate and identify additional core competencies required by rural radiographic workforce.
- identify the challenges that rural radiographers face in the execution of their duties
- analyse the curriculum of a radiography training school in an area where the study was done and compare with the study results to determine competencies that may not have been included in the curriculum.
- Propose a CPD strategy based on the results of the study.

1.5 SIGNIFICANCE

The benefits of rural general diagnostic imaging examinations in rural settings to help rural physicians in the diagnosis of ailments are well known. However, little is known about the additional competencies required by radiographers working in rural areas who are behind the delivery of this important service.

Investigating and identifying additional core competencies needed by radiographers working in rural areas may, for example, provide a focus for future continuous professional development strategies in South Africa. The value of identifying specific core competencies is likely to help radiographers working in rural hospitals to work with other health professionals to effect the change and consequently resolve conflicts in the provision of rural health care. It may also identify possible professional opportunities for this group.

The outcome of this research thus may result in;

- improvement of rural radiographic practice
- contributing to the body of knowledge regarding additional competencies needed by radiographers working in rural areas of South Africa.
- an increase of research that is related to rural radiographic practice and other rural health professionals.
- raising the profile of radiographers working in rural hospitals.
- providing a clear training strategy that takes into account the needs of radiographers working in rural communities.
- possible suggestion of inclusion of identified competencies to the current curricula for undergraduate radiography students.

The proposed study also fits into the aspirations of providing quality primary health care services by the DoH. By investigating and identifying core competencies needed by radiographers working in rural areas, this study intends to contribute towards an understanding of the required roles and responsibilities as well as competency development requirements. In a situation where knowledge, skills and values are identified, it may be possible for rural hospital authorities to be able to evaluate the care given to the patients by radiographers and as such hold them accountable for their practice.

A shortage of health professionals including radiographers in South Africa in particular rural hospitals has been identified (Lloyd, Sanders & Lehmann 2010:172). Mapping out the learning and additional competency development for this group of professionals may be an important future strategic undertaking in a bid to keep radiographers in rural hospitals. It is expected that the proposed CPD strategy will optimize the functioning of this group of professionals.

With the proposed National Health Insurance (NHI) by the South African DoH, the skills and performance of rural radiographers will become even more imperative. The success or failure of NHI, according to Lloyd *et al* (2010:176), would rely on the need for a skills mix of health professionals with a view to task-shifting. Currently there is no precise data to benchmark the utilisation of diagnostic imaging in rural

hospitals of South Africa. An audit of such services in the United Kingdom (UK) revealed a significant shortfall in radiological capacity due to poor usage of its resource (Boland 2006:862). The likely approach to counter this trend is to monitor the service and suggest ways of improving the service by developing specific strategies that will equip radiographers working in rural areas to provide an effective diagnostic imaging based on core competencies required. An effective way of doing the above for this group of professionals will demand sound and evidence-based research of the additional core competencies required by radiographers working in rural hospitals. This is also echoed by Whelan (2006:199) who confirms that part of maintaining high quality rural health care workforce is through determination of core competencies.

The challenges encountered by radiographers working in rural areas require identification and evaluation of additional core competencies. It is therefore essential that the elements of additional competency aligned to rural radiography are clarified. It is also equally important to recognise the need to maintain and update these competencies in the face of changing rural challenges.

Recognising the additional core competencies and proposing a CPD strategy may also play an important role in improving these radiographers' motivation, performance and management of diagnostic units thereby integrating the service and reducing wastage of resources. Besides, results of this study may feed into the appraisal and development of policies, and guidelines that take into account the specific role of radiographers working in rural hospitals. These policies and guidelines may help rural radiographers to make the best of their local x-ray departments and at the same time offer uniformity and structure to the practice of rural radiography.

1.6 DEFINITION OF KEY CONCEPTS

According to Ahnen (2008:289) the word concept is defined as a mental impression of a certain object or phenomenon.

- *Radiographer:* For the purpose of this study, the radiographer is a

- professional who uses x-rays, Magnetic Resonance Imaging (MRI) and other forms of imaging technology to produce images of patients' medical conditions in order to help clinicians in diagnosing.
- *Diagnostic imaging:* According to Gofman (1999), diagnostic imaging means primarily, but not exclusively, x-rays and it also includes fluoroscopy and computer tomography scans. In the context this study diagnostic imaging will include conventional radiography, MRI, radiotherapy and ultrasound.
- *Core competencies:* Axley (2008:216) refer to core competencies as the individual's ability to successfully or competently perform the requisite action with the use of a compilation of group of skills or procedures. For the purpose of this study, core competencies shall be defined as additional individual rural radiographer's competencies, other than those obtained at the point of graduation, such as knowledge, skills, attributes, leadership skills and behavours required to successfully practice radiography in rural areas.
- *Rural:* Scharff (1998:21) describes rural as being a long way from anywhere and pretty close to nowhere. In the context of this study rural shall be defined in relation to topology, geographical, socio-economical and degree of physical infrastructure. Thus a rural is an area where residents may not have easy access to concentrated and advanced services of urban hospitals.
- *Rural district hospital:* For the purpose of this research a rural district hospital shall be defined as a level 1 hospital that supports PHC and also acts as a gateway or that refers patients to more specialised hospitals (DoH 2002:3).
- *Continuing Professional Development (CPD):* In the context of this study CPD shall be defined as a process which encompass learning activities which follow graduation that may include professional skills, management skills, leadership skills, work based and personal professional development, technical and clinical skills and behaviours (Children Workforce Development Council 2006:14).

1.7 STUDY FOUNDATION

A philosophical and theoretical framework will form a base on which the discussion of the foundation of this study will be based.

1.7.1 Philosophical paradigm

Polit and Beck (2008:14) describe an individual's general worldview on the complexities of the real world as a paradigm. Creswell and Plano Clark (2011:41) identify mainly four broad worldview paradigms namely naturalistic, post positivist, participatory and pragmatic paradigms. These paradigms or worldviews have an impact on how the individual researcher conducts their studies. This study on additional core competencies of radiographers working in rural areas used a pragmatic point of view. Morgan (2007:48) also advocates for pragmatic approach as a new guiding paradigm both as a basis to support combined qualitative and quantitative methods. Literature indicates that pragmatism draws on many ideas and it values both objective and subjective knowledge (Creswell & Plano Clark 2011:43).

The pragmatic paradigm therefore allows for a research problem to be approached from different angles namely qualitative (constructivist) and quantitative (positivist). Polit and Beck (2008:15) argue that the constructivist paradigm is made of multiple realities such as subjectivity, individuality and the context of the research. This implies that in the context of this study, the perceptions and experiences of a small group of radiographers in Phase I of the study were subjective and were likely to be influenced by a number of factors.

The post positivism, according to Creswell and Plano Clark (2011:415), is characterised by reductionism, detailed measurement of variables and testing theories which underpins its belief. Phase II of the study collected quantifiable data from the participants. Therefore, pragmatism guided the researcher in addressing the research problem since it has a strong foothold in mixed methods and as such it offers an immediate and useful middle position both philosophically and methodologically (Cameron 2009:140).

1.7.2 Theoretical Framework

Even though the use of conceptual or theoretical frameworks in mixed methods research in health sciences is not widely accepted, some researchers have argued that the need for theoretical or conceptual frameworks to guide in the design of mixed

methods studies can be connected with pragmatic approaches (Evans, Coon & Ume 2011:276). This assertion, according to these authors, may be reflected in the rising number of the use of competency frameworks in mixed methods studies by the nursing discipline. The focus of competency frameworks, according to Teodorescu (2006:28), is the definition of knowledge, skills and attributes that successful people have. Therefore, in order to investigate and identify additional core competencies required by radiographers working in rural areas a competency framework that sets out and describes individual competencies is required.

However, in the context of this study, the literature search revealed very little on competency frameworks that would fit radiographers working in rural areas other than the one for senior allied health professionals in Australia (Lin *et al* 2009). Most of the literature on conceptual frameworks was for entry level for other health professionals such as nurses and doctors.

Despite the differences in the definitions of competency and competence frameworks as noted by Teodorescu (2006:28), thematic analysis of two frameworks, conceptual framework proposed by College of Nurses of Ontario (2011:11) for entry level nurses and the conceptual model proposed by Lin *et al* (2009) revealed similarities in the themes. This apparent thematic similarity made the researcher to adjust and adopt the two frameworks. This means that the two frameworks, which are discussed in detail in chapter 2, were used to inform the contents of the framework that guided this study. The resulting framework which is also discussed in detail in Chapter 2 was then called the Rural Radiographers Competency Framework (RRCF). The RRCF is reflected in Figure 1.1 below.

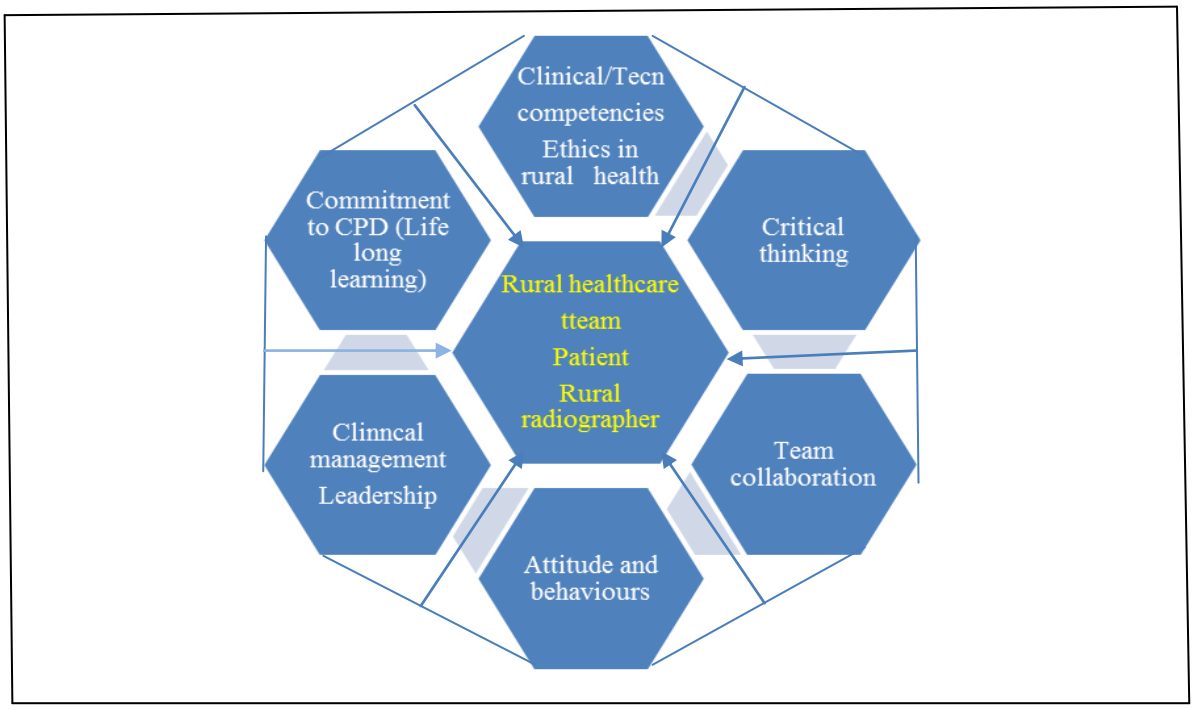


Figure 1.1: Rural Radiographers Competency Framework (Adapted and modified from Lin *et al* 2009 and CNO 2011:11)

This framework attempts to justify the premise that competencies focus on skills, knowledge, attributes and desirable behaviour that may be required to perform effectively within a specific job role and in a specific work environment (Teodorescu 2006:28). This study was framed by the competency framework adjusted from Lin *et al* (2009) and the CNO (2011:11). One of the key factors that this competency framework outlines is the relationship of the individual radiographers' behaviour towards the patient, health care team and institutional goals (Bartram 2011:6). This framework presentation further demonstrates that there is no single competency which is more or less important than another competency (CNO 2011:14).

Furthermore, this framework will possibly inform this research to articulate a set of additional competencies that rural radiographers may require in order to meet the demands of rural imaging. The competency framework further provided a basis under which addition core competencies required by radiographers working in rural hospitals were to be investigated and further guide the researcher in an attempt to propose a CPD strategy programme that may be used to bridge the gaps that may be identified.

1.8 OVERVIEW OF RESEARCH DESIGN AND METHODOLOGY

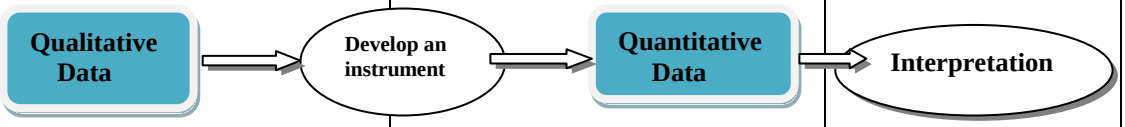
A detailed description of the research design and methodology is covered in Chapter 3. The description below is a brief outline of the research approach that was followed.

1.8.1 Research design

Burns and Grove (2005:211) define research design as a blueprint for a study. In order to research the problem namely core competencies required by radiographers working in rural areas of South Africa, the researcher used a sequential exploratory mixed methods design. Exploratory sequential design is a two-phased study in which the researcher begins by exploring the problem in Phase I before building on to the next phase (Creswell & Clark Plano 2011:87; Cameron 2009:144).

Phase I of the study dealt with the collection of qualitative data while Phase II used quantitative data collection methods. Cronholm and Hjalmarsson (2011:87) suggest that in a situation where there is lower pre-knowledge of a phenomenon to be studied, a researcher should start with a qualitative approach. Creswell and Plano Clark (2011:5) argue that the combination of quantitative and qualitative approach provides a better understanding of the research problem than either approach alone. Table 1.1 reflects a summary of the research process that was followed.

Table 1.1 Visual presentation of summary of the research process

Phase I	Phase II	
		
Population ▪ Radiographers working in rural hospitals of KZN for a specific time	**Population** ▪ All radiographers working in level 1 rural KZN hospitals ▪ One curricula from radiography school	▪ Summarize and interpret qualitative results ▪ Interpret the quantitative results ▪ Decide how the results of quantitative support or expand on the qualitative results ▪ Curriculum audit ▪ Based on these results propose a CPD strategy
Sampling method ▪ Purposeful sampling (N= 7)	**Sampling method** ▪ Census sampling	
Data Collection ▪ Focus group interview Open-ended interview • Note taking	**Data Collection** ▪ Postal survey with structured questionnaire developed based on the analysis of qualitative data ▪ N=135 radiographers working in rural areas ▪ Audit instrument for curriculum	
Data Analysis ▪ Creswell's data analysis approach such as identifying themes. (Creswell 2003:191).	**Data Analysis** ▪ Descriptive and inferential statistics using Epi Info version 7.1.5 and Microsoft excel	
Rigour ▪ Credibility, Confirmability, Dependability and transferability	**Rigour** ▪ Pre-test of questionnaire. ▪ Standardise questionnaire to increase reliability ▪ Internal validity, content validity	

1.8.2 Study population

Polit & Beck (2008:761) describe a study population as the entire set of individuals who have common characteristics. In the context of this study, the study population included all radiographers working in all Level 1 rural district hospital in KZN.

1.8.3 Sampling and sample size

The study used a parallel sample relationship which entails that the samples for the focus group interview and survey were different but drawn from the same population

of interest (Onwuegbuzie and Collins 2007:292).

A purposeful sampling method was used to select seven participants for the first phase while census was used to sample 135 respondents in the second phase of the study.

1.8.4 Data collection

Data collection was conducted in two phases. Phase I involved the collection of qualitative data through a focus group while in Phase II involved quantitative data collection using a survey questionnaire.

1.8.5 Data analysis

In the context of this study a sequential data analysis was used. In the first phase the researcher used thematic analysis while in the second phase descriptive and inferential statistics were used.

1.8.6 Research setting

The study on the additional core competencies required by radiographers working in rural hospitals of South Africa was conducted in KwaZulu-Natal's Level 1 rural district hospitals. The setting for collection of qualitative data (Phase I) was at the venue (hotel) in the northern part of KZN province. This venue was selected because it was centrally situated in relation to places where invited participants (N=7) who were selected to take part in the focus group interview were coming from.

Collection of quantitative data in Phase II was done on all radiographers working in rural KZN hospitals classified as level 1. All radiographers working in the rural district hospitals in KZN represented the population. Conversely, the assertion by LoBiondo and Haber (2006:135) that the results of the study will have a meaning in a specific setting becomes more apparent in the context of this study.

1.9 ETHICAL CONSIDERATION

Permission to conduct the study on core competencies of radiographers working in rural hospitals of KZN was sought and obtained from Provincial Health Research and Knowledge Management Committee of the KwaZulu-Natal and the University of South Africa's (UNISA) ethics committee. An application for permission to analyse the radiography training curriculum was submitted to the Head of Post Graduate Studies at a university of technology. The researcher ensured that no harm was brought upon the participants by providing them with enough information before consenting to take part in the study. The detailed discussion of the basic principles of research namely beneficence, justice and respect of human dignity are discussed in Chapter 3.

1.10 SCOPE AND LIMITATIONS

This study did not measure the actual performance abilities of the radiographers working in rural hospitals. The study only focused on radiographers working in rural areas of South Africa, specifically the KZN province and an analysis of one curriculum as it was felt that covering all rural hospitals in South Africa would make the study extremely large and costly. This, then, means that other provinces and curricula from other radiography training institutions were excluded. Although this research is limited to one province's rural hospitals, the additional core competencies required by radiographers working in rural areas may be applicable to other rural radiographers in other provinces. The researcher may have introduced bias during the analysis of qualitative data because of its interpretive nature. Another limitation of this study is that there was a potential risk of non-response error in the quantitative phase because of the use of postal questionnaires. Furthermore, Phase II was a survey which was a snap-shot. This entails that the study was unable to represent possible changes of individual competencies required by rural radiographers over time.

1.11 MIXED METHODS THESIS PRESENTATION

Evidence from published literature reveals that there are two models of mixed methods thesis presentation namely segregated and integrated (O'Cathain 2009:140).

The segregated model according to this author is where the methodology of the qualitative and quantitative phases of the research are assigned a chapter each whereas the integrated model presents both phases in a single methods chapter.

1.11.1 Structure of the thesis (Integrated Model)

This study used an integrated model of mixed methods thesis presentation where methodology for the qualitative phase and the quantitative phase were described in a single methodology chapter, in this case Chapter 3. However, results from each phase were each presented in separate sections namely Chapter 4 and Chapter 5 respectively. The entire thesis was divided into seven chapters as follows:

- Chapter 1 presents the introduction by outlining the background to, purpose, aim, objectives and significance of the study.
- Chapter 2 presents literature reviewed for this study
- Chapter 3 describes research design and methodology
- Chapter 4 presents qualitative data analysis and interpretation
- Chapter 5 presents quantitative data analysis and interpretation
- Chapter 6 presents a discussion on the curriculum audit and the process followed in the development of the CPD strategy proposal
- Chapter 7 presents the discussion, limitations of the study and recommendations.

1.12 CONCLUSION

This chapter discussed the background to the study, the problem statement, study purpose, aim and objectives of the study, as well as the significance of the study. The competency framework that guided this study was introduced and discussed briefly. The key concepts were also defined and an overview on the research design and methodology was also outlined.

Literature review is covered in the next chapter.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter discusses the literature review on the core competencies that may be required by radiographers working in rural areas. The researcher, through this review, attempted to cover both theoretical and empirical sources that may be related to the main concepts of the topic under study. The aim of the review was to gather enough information on the topic in terms of what is known and what are the possible gaps that may exist in the body of knowledge.

2.2 PURPOSE OF THE LITERATURE REVIEW

Since research is rarely conducted in a vacuum, a researcher usually conducts a thorough literature review in order to familiarize himself/herself with the existing knowledge base (Polit & Beck 2008: 105). Literature review is thus an essential component of research. It is therefore imperative that a researcher undertakes a literature search in order to find the best available evidence for a given area of study (Brettle & Gambling 2003:229). Apart from acquiring insight into the topic under study, this researcher undertook a literature review to find out what was already known about additional core competencies that may be required by radiographers working in rural areas of South Africa and in particular rural KZN. Other than acquainting the researcher about the current existing knowledge about the topic, the literature review contributed towards;

- The development of a conceptual context in which the study was placed
- The identification of relevant concepts about the topic
- The identification and adjustment of research methodology
- Identification of competency frameworks that may be related to the topic under study.

2.2.1 Scope of literature review

In the context of this study, an extensive search was conducted using electronic databases through the UNISA library. The search was limited to articles written in English language only. Searches were performed throughout the study period. Some of the data bases searched through the UNISA library link included but were not limited to ProQuest, JSTOR, Digital Dissertations etc. A sizeable number of articles on health professionals' competencies were found but most of them were related to medicine and nursing professions. Furthermore, this literature review draws mainly from studies done in developed countries such as Australia and the UK. In this regard, this researcher would fully agree with Gardner and Boucher (2000:3) who cautions that it may not be correct to assume that this is a true and complete picture of additional core competencies required by rural radiographers in KZN. Nevertheless examination of the literature influenced this researcher's thoughts about the topic under study. Many of the literature have been referenced in this study.

2.3 RADIOGRAPHY IN SOUTH AFRICA

2.3.1 The concept of radiography

Under this subsection the researcher attempts to provide an overview of the concept of radiography as well as what contrasts radiography from other allied professions such as physiotherapy or speech therapy.

A conceptual analysis of radiography by Ahonen (2008:291) found that the concept is characterised by radiography as it is used only in health sciences. The analysis by the same author further revealed that the concept and the profession of radiography is the core aspect that differentiates radiography in health sciences from the one associated with technology and physics. This means that the concept of radiography differs from one discipline to another and hence may have a different meaning of the context and professional question (Ahonen 2008:292).

When looking at radiography within the broader health context, an area which contrast radiography from other clinical support services or allied health professions

such as physiotherapy, speech or occupational therapy is that diagnostic radiography, in many instances, is done before a diagnosis is made rather than after (Reeves & Decker 2012:78).

2.3.2 History of radiography in South Africa

Radiography has evolved over many years but radiography practice as profession is relatively young in South Africa when compared to medicine and nursing. The radiography profession in South Africa may be traced back to a Mr. A. Walsh, a member of the then Port Elizabeth Amateur Photographic Society, who in 1896 successfully exposed using the x-ray apparatus (Bensusan 1967:778). The importance of x-ray examination was brought to bear during the 1899-1902 Anglo-Boer war in South Africa. The British soldiers had a military medical support division and the Boers were supported by the German Red Cross. During this time, the role played by operators of the x-ray machine soon to be called radiographers was recognised (Engel-Hills 2005:24b). And in 1933, according to the same author, South Africa had the first qualified radiographer. Groote Schuur Hospital in South Africa's Western Cape Province started a formal diagnostic radiography training in 1953 (Engels-Hills 2005:24b). Since then, the advancement and positive change in radiography as a profession has been remarkable.

Radiography in South Africa has over the years grown and the technological advances in this field have helped to position radiographers as important members of the multidisciplinary health care team (Engel-Hills 2005:2a). There are now four distinct categories of radiographers in South Africa; namely diagnostic, nuclear medicine, radiotherapy and ultrasound. However, radiotherapy and nuclear medicine are not practiced in rural areas. These disciplines are only limited to tertiary (level 3) hospitals.

2.3.3 Scope of radiography practice

The Health Professions Act No. 56 of 1974 states that the radiographer shall not perform duties which are not within the radiographer's scope of registration (Gqweta 2012:12). This Act further stipulates that the radiographer may only discuss the

appearance on the x-ray film with the requesting doctor. This is in contrast with the legislation in the UK that governs radiographers' scope of practice which include diagnostic imaging interpretation and has in the past 20 years extended to include plain x-ray examinations, breast imaging, computed tomography, ultrasound and contrast examination (Society of Radiographers 2010:7).

Just like in many other developing countries, a lot of people in South Africa do not know what a radiographer is and what a radiographer does. Even though many people and indeed patients may at one time had an x-ray performed by a radiographer, many of these people according to Pratt (2005:2) believe that it was either a nurse or doctor. This argument is supported by the California's Hospital Association (2011:4) who also noted that in most countries many people think of doctors and nurses as the only professionals providing health services. According to the same Association there are other health professionals such as radiographers providing imaging a very important service needed for diagnosis and treatment of patients. To this effect, Cowling (2013:90) writing in the editorial comment acknowledges that there is still a gap in the formal recognition of radiography as a profession between developing and developed countries. In South Africa, this is reflected in the majority of the general public who think of radiography as just taking pictures of bones and chest. Some health professionals have the same perception. This perception may be linked to the legislation which confines the radiographers to producing images only. While evidence elsewhere indicates that radiographers contribute significantly towards reporting and thereby improving service to the patients (Society of Radiographers 2010:7). The scope of South African radiography practice limits the radiographer to discussing his/her opinion on the X-ray image with the requesting clinician only (Gqweta 2012:22). This researcher argues that this is against what is observed in everyday practice which indicates that there is need for radiographers at PHC level, to be fully engaged in the management of patients through interpretation of radiographic images.

The scope of radiographic practice should be broad enough to include additional core competencies required by radiographers to manage the different aspects of radiography practice. The Queensland Department of Health (2013:4) argues that the scope of practice needs to be well defined in order to ensure that roles, duties and

responsibilities are clearly articulated. Yet in the in context of rural district hospitals the scope of radiographic practice has somehow never been debated or clarified despite the broad range of responsibilities that rural radiographers are required to shoulder.

Evidence from literature suggests that the scope of radiography practice is affected by the place where one practices (Smith & Hays 2004:69). The assumption is that the current scope of radiography practice is inadequate and limiting to govern rural radiography as it is supposed to be practiced today and tomorrow. If additional core competencies required by radiographers working in rural areas can be delineated, it may be possible to pave the way for expansion of responsibilities and also provide for professional growth. Reid (2006:677) is also of the view that the challenges that are faced by rural health care professionals require specific and wide-ranging skills. This is because the practice of rural radiography resembles that of a generalist whose practice extends across disciplines. The broadness of the rural radiographers' responsibilities hold true for other rural healthcare professionals such as doctors, nurses, physiotherapists or dieticians (Strasser & Neusy 2010:777).

2.4 DISTRICT HEALTH SYSTEM

South Africa's health system is modeled on the DHS. This is the system that was adopted as a means of delivering comprehensive PHC in the country after the 1994 elections (Department of Health 2002:3). There are three layers in this system namely; district hospital, PHC clinic and community (Figure 2.1). In the South African context, the government used a system of hierarchy of health care services (Cullinan 2006:6). According to the same author, the entry level of health care service is provided by PHC clinics and Community Health Centre (CHC). Patients at the entry point who may need specialised treatment are referred to a secondary level hospital commonly known as district hospital (Cullinan 2006:6). These hospitals are grouped in categories namely district, regional and tertiary or level 1, 2 and 3 respectively (Figure 2.2).

The district health system requires a well-functioning referral system between these levels (Görgen, Kirsch-Woik & Schmidt-Ehry 2004:39). The DHS based on the PHC

has however faced a number of problems such us unequal distribution of health professionals between rural and urban and also lack of appropriate competencies by health professionals (Lloyd, Sanders & Lehman 2010:172). Despite these problems the DHS based on PHC still remains central to health systems of most countries on the African continent including South Africa (Görgen *et al* 2004:28).

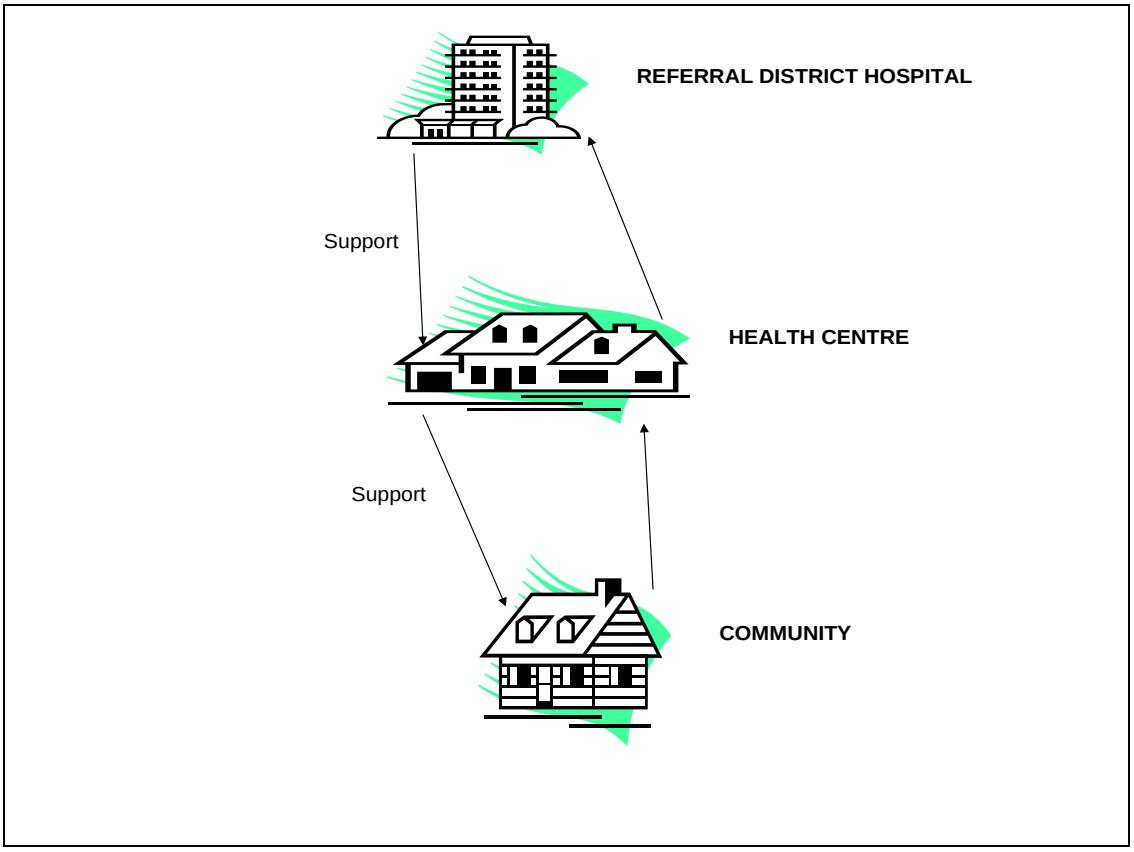


Figure 2.1: **District Health System**
Source: UNICEF (2006).

This paradigm shift towards PHC impacts on the delivery of rural health care services including radiography and therefore has created an urgent need to review the roles and competencies of various rural healthcare staff including radiographers. The review must be aimed at promoting the best healthcare services in this case rural radiographic imaging that will ensure optimal treatment for rural communities.

To this effect, radiographers working in rural areas of South Africa should be competent and flexible to be able to adjust and fit in the various strategies that are

currently being developed by the National Department of Health (NDoH) to respond to the challenges that impact on the quality of PHC services (Fryatt, Hunter & Matsoso 2014:35). The core of these various strategies, according to the same authors, is the development of the Ideal Clinic. A component for diagnostic support service which imaging is part is also included in the range of integrated services that must be offered by the Ideal Clinic. Figure 2.2 below reflect a modified diagrammatic presentation of the South African version of the DHS.

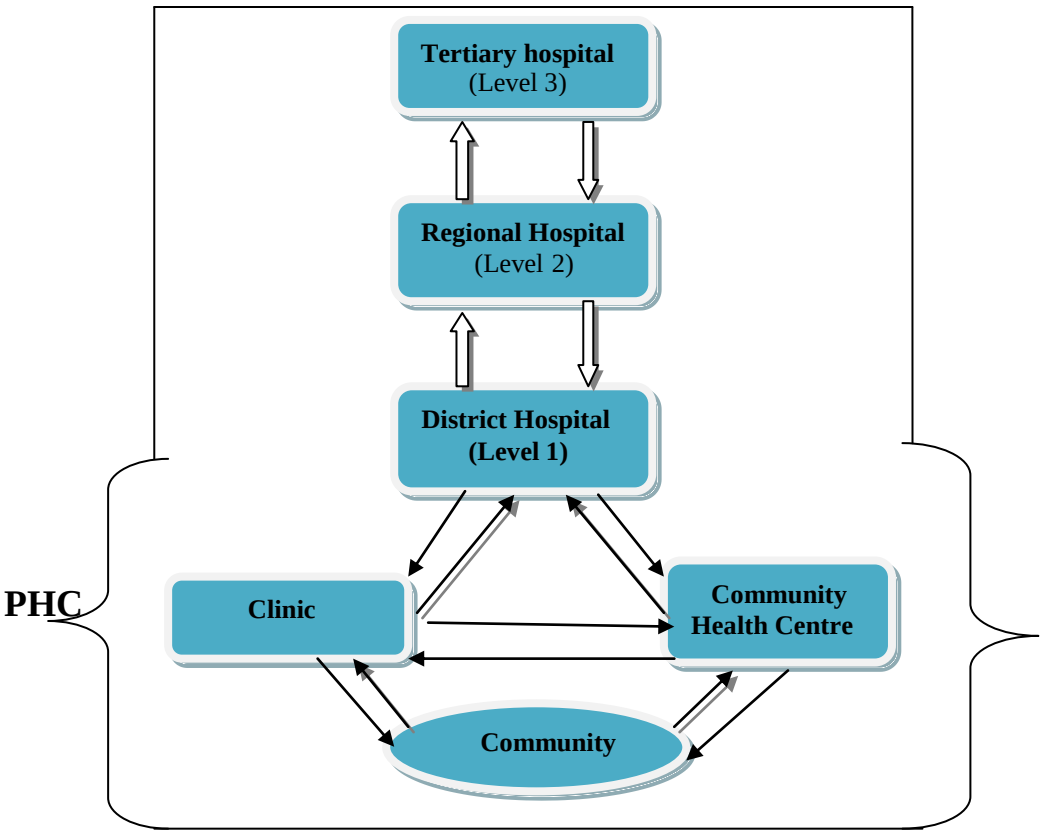


Figure 2.2: Modified South African version of the District Health System.
Source: KZN department of health

2.4.1 Brief global perspective of 'rural'

Literature reveals different definitions of the concept 'rural' between countries based on either historical reference or density and locality (Howie 2008:3). For instance, Scharff (1998:21) describes rural as being a long way from anywhere and pretty close to nowhere. In the face of myriad definitions of 'rural', Racher, Vollman and Annis (2004:62) attempts to describe 'rural' through abstractions that are organised

into four categories namely;

1. ‘‘Description of rural’’
2. ‘‘Dichotomies of rural and urban’’
3. ‘‘Typologies across the geographical gamut or specific to rural’’
4. ‘‘Indices or indexes of factors weighted to determine degree of rurality’’

From the above abstractions, Howie (2008:4) went a step further and presented the above four delineators that describe ‘rural’ into what was called ‘‘the rural framework wheel’’ (Figure 2.3).

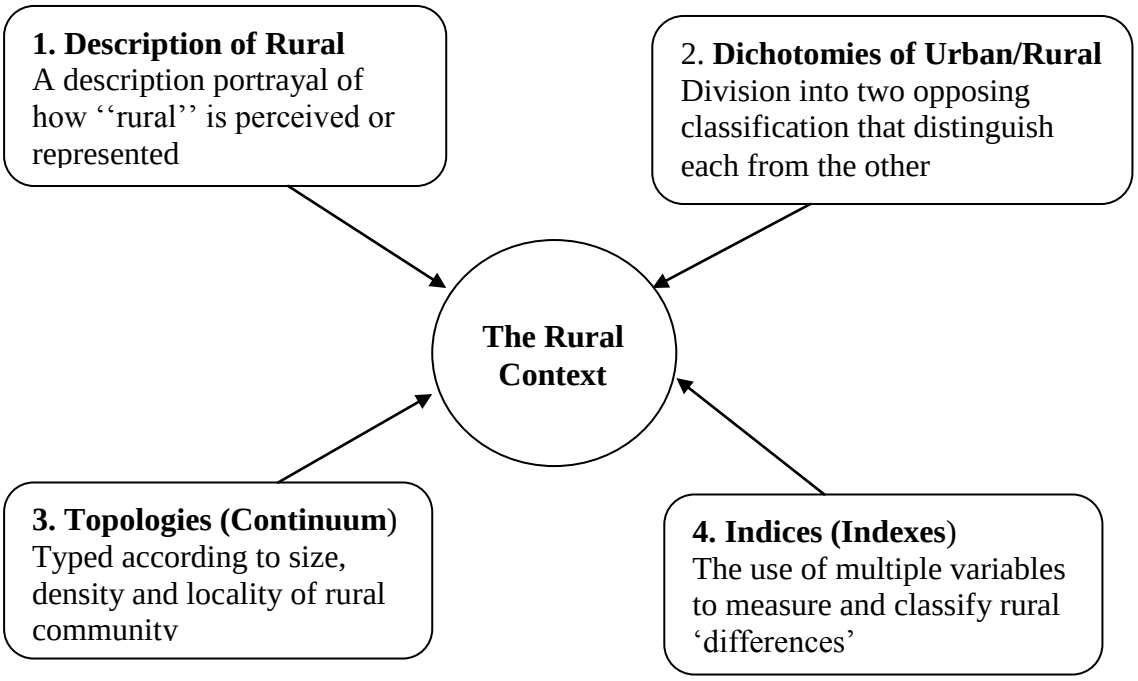


Figure 2.3: Step one of rural framework wheel

Source**:** Howie, 2008:4

In light of the above presentation of the rural framework wheel by Howie (2008:4) and the various definitions of ‘rural’ found in literature, the suggestion made by Halfacres (1993:34) that the definition of ‘rural’ should be tailored to the task at hand becomes more salient. On the contrary, other authors have raised concerns for the apparent definitions of ‘rural’ by specific disciplines for a particular purpose and specific situation for which the fit is debatable (Racher *et al.* 2004:62). Despite such an argument, Halfacres (1993:34) insists that it is neither feasible nor desirable for an individual to search for a single all around definition of ‘rural’. This assertion is supported by Racher *et al* (2004:74) who concludes that the definition of rural is a

complex and multifaceted process that changes. Nevertheless, in the context of this study, rural is defined in relation to topology, geographical, socio-economical and degree of physical infrastructure where it is located. Thus a rural district hospital is the hospital located in an area where residents may not have easy access to concentrated and advanced services of urban hospitals.

2.4.2 Rural district hospital

This subsection focuses on the x-ray services in rural hospitals, number of radiographers working in rural hospitals and challenges faced by the rural district hospitals in the delivery of diagnostic imaging are also covered. Other areas covered include the practice of rural radiography and quality of radiographic services in rural district hospitals. By covering these areas the researcher is attempting to show how these are likely to influence the type of competencies needed by rural radiographers.

2.4.2.1 Introduction

At primary level clinic in South Africa you will find qualified health professionals such as registered nurses but no radiographers in most cases. The district hospitals, many of which are in rural areas, act as referrals for all services at primary level (Görgen *et al* 2004:34). Rural district hospitals are manned by qualified doctors who are not specialists and who have access to basic diagnostic services such as x-rays, ultrasound and basic laboratory tests (Cullinan 2006:13). The same author writes that the district hospital is likely to be the only hospital many of the rural community members will ever get admitted to. This may be associated with the fact that many rural community members are poor and hence do not have medical insurance. Therefore, many of them depend solely on the government health service. To this effect, Hurmel (2007:9) argue that rural hospitals must be considered as important to the rural communities' overall health needs. Due to the disease profile of the rural communities, many of them require diagnostic imaging services.

2.4.2.2 Challenges faced by rural District Hospitals

The rural health care system is different from that which is delivered in urban areas

and can sometimes be complex with a myriad of systemic issues that are bound to make even the provision of conventional radiography difficult. It is, therefore, important that radiographers understand the rural and urban contexts and their differences. A competent radiographer can do so by identifying the type and nature of the health needs of the rural community and be able to work towards providing quality diagnostic imaging,

Rural district hospitals are faced with a number of challenges in their quest to address the health needs of the rural local communities. Some of these challenges include attracting and retaining health professionals such as doctors, nurses, pharmacists and radiographers. In addition, Hurme (2007:8) pointed out other factors including lifestyle differences in rural areas as compared to urban areas as well as remoteness of some of the hospitals being associated with recruitment and retention challenges. There are shortages of specific healthcare professionals including radiographers.

Despite these challenges, the rural district hospitals must be accountable for the level of competency of their employees. This is because rural communities also deserve quality healthcare services just like their counterparts in urban areas. This quality healthcare service includes diagnostic imaging delivered by radiographers who are imperative members of the rural healthcare team. This means that the competency levels of individual radiographers working in rural areas are paramount and any problem arising from competency failure on their part can place the rural district hospital in legal problems (Hurme 2007:9). The same author argues that it is the responsibility of the hospital to foster competency among its employees including radiographers.

2.4.2.3 X-ray Services in South Africa's rural district hospitals

Like in other developing countries, provision of x-ray services in South Africa is affected by the unavailability of staff and equipment (Mung'omba 2011:15). In rural hospitals, radiographic imaging services are delivered using the most basic conventional equipment as compared to that in urban or academic hospitals which is delivered using the most complex and sophisticated equipment. Furthermore, Thulo

(2006:1) reports that, in South Africa the rate of development in radiography technology takes place at different rates between private and public hospitals. The majority of private hospitals are far more advanced in radiography technology than public hospitals and in particular rural hospitals. However, radiographers who are trained on sophisticated x-ray equipment are expected to use basic conventional x-ray equipment for radiography once in rural hospitals which still accounts for high utilisation. A survey done in the United States of America on the utilisation of radiology showed that almost half of all diagnostic procedures involved conventional radiography (Bhargavan & Sunshine 2005:286). While in Norway trends in diagnostic radiology examinations showed that in 2002 conventional radiography accounted for approximately 60% of all imaging procedures (Børretzen, Lysdahl & Olerude 2007:346).

2.4.2.4 Radiographic imaging in rural district hospitals of KZN

Radiographic services in rural KZN hospitals may vary depending on the complexity of the x-ray equipment. As indicated earlier, conventional radiography and basic ultrasound are the only radiological modalities available in these rural KZN hospitals. It should however be noted that these modalities are managed by radiographers with no radiologists to provide clinical and management support. Nevertheless, the information generated by radiographers using these diagnostic imaging modalities contributes significantly towards clinical decision-making process. This is also the view of Manning, Gale and Krupinski (2005:683) who argue that the function of diagnostic imaging is to provide information and reduce diagnostic uncertainty. Having diagnostic imaging that provide reliable information for proper diagnosis require a competent radiographer.

Despite that fact that radiographic examination itself does not relieve pain, the perception of the researcher is that a lot of clinicians in rural district hospitals of KZN prefer to refer patients for x-ray examination as a therapeutic intervention. Some of these diagnostic imaging examinations, according to Ferrante di Ruffano Hyde, McCaffery, Bossuyt and Deeks (2012:e686), maybe requested by doctors just to reassure and satisfy the patients. Regardless of the doctors' motives, all these requests are in the end executed by radiographers. This high workload may have an

impact on radiographers and is bound to influence the behaviours of radiographers working in rural areas and consequently long-term stay in these rural hospitals.

Yet, radiographers working in rural hospitals seem to be powerless to effect the change. One is bound to wonder whether this failure to effect a positive change is due to a lack of required additional competencies aligned to the rural work environment. Another factor that may be linked to this failure is a lack of a well-defined broader role of the radiographer working within the rural healthcare setting. Smith (2006:7) on the other hand suggests that this failure may be attributed to the fact that radiography as a profession has been a subject of subordination and limitation from other healthcare professions such as medicine. Radiographers can only overcome subordination if they can exhibit professional expertise that will help them to integrate diagnostic imaging in the wider rural health care programmes. In rural hospitals, it is important for radiographers to integrate themselves into the multidisciplinary team with the aim of contributing to the overall rural health care.

2.4.2.5 Number of radiographers working in rural areas

As was indicated earlier radiographers are an essential component of the rural health care team but their availability is also limited. Radiography, among other health professions, was identified by the then minister of health as a profession that was experiencing a shortage of staff (Tshabalala-Msimang 2004:50). According to the 2012/2013 HPCSA's annual report there was a combined total of 6,868 registered radiographers in the country (HPCSA 2013:20). A combined total means that the number includes all radiographers across the four categories namely; diagnostic, radiotherapy, nuclear medicine and sonography.

Just like in many countries, such as Australia, rural hospitals in KZN have a daunting task of attracting radiographers to work in these hospitals. The current distribution of radiographers favours the urban hospitals. Just like in Australia the shortage of other health professionals in rural areas such as doctors and nurses is well documented, but this is not the case with regard to radiographers in rural areas and as such consistent data is not available both at provincial and national level (National Rural Health Association 2008:3). Even though the WHO reports that 50% of the world

population lives in rural areas, there is still a widespread shortage of health professionals which includes radiographers in these areas (Keane, Lincoln & Smith 2012). This problem has a direct impact on the quality of rural radiographic services. The movement of radiographers from rural areas to urban actually cripples the already fragile rural health care delivery system. For instance, a study conducted by De Villiers and De Villiers (2004:23) on rural doctors' views about working conditions in rural hospitals reported on the frequent unavailability of x-ray services after hours. This frequent unavailability of x-ray services after hours may be linked to the shortage of radiographers in rural hospitals.

Apart from social and infrastructure factors related with rural hospitals, the training of radiographers in South Africa is highly urbanized and centralized in city based universities just like in Australia (Smith, Brown & Cooper 2009:236). It is therefore essential to identify factors that may cause shortages in terms of what rural health practitioners, such as radiographers, need and then work towards meeting those needs (Mokoka 2007:12). This author identifies career development and professional recognition as motivation factors that may be used to keep radiographers in rural areas other than the usual financial incentives. On the other hand authors such as Ducket (2005:201) have argued that the future workforce planning for health professionals in the 21st century should be placed on different mix of responsibilities rather than trying to provide more of the same. This means that rural radiographers require an expanded competency base.

2.4.2.6 The practice of rural radiography

The importance of radiography as an integral component of the South African health care system and as an integral part of the PHC has already been mentioned above. Radiographers working in rural hospitals contribute significantly towards appropriate treatment of diseases and injuries through diagnostic imaging (Maru *et al* 2010). The existing scope of practice for radiographers however appear to be limited and the list of competencies required by radiographers working in the rural areas in the context of South Africa has not been compiled. Such a working environment where there is no clear scope of practice could cause radiographers to have low self-efficacy and poor belief in their own abilities (Minisini, Sheppard & Jones 2011:5). These authors

further argue that the consequences of such a situation are that individual health practitioners, in this case radiographers, tend to believe that they lack skills and attributes which in turn lead to issues of incompetency. This, then, relates again to issues of not being sure of what they are supposed to do.

The demands of today's rural radiography put increased pressure on both the radiographer and the hospitals that provide the service. Rural hospitals are pressured from both the government and communities to improve the quality of healthcare as it may be the case in cities. With this pressure for quality health care ever present, radiographers working in rural areas are required to do more (Akroyd, *et al* 2008:114). The researcher has observed that the challenge for most radiographers working in rural areas is that radiography practice is guided by protocols despite the increased responsibilities assigned. The professional Act of the radiographers, for instance, states that ''a radiographer shall perform acts at the written request and under the supervision of a practitioner approved by the board for such purpose (Profession Board of Radiography and Clinical Technology 2006:1). Sim (2002:4) is however against blind adherence to protocol as this only suggests that the radiographer is not a thinker but merely a follower. Radiographers working in rural hospitals of South Africa need to possess competencies that allow them to be thinkers and be able to transcend discipline barriers. The extra responsibilities for rural radiographic practice demand multi-skilling by these radiographers not just in diagnostic imaging capabilities. This might improve the capability of radiographers working in rural health care to adjust to the needs of the communities (Hardy, Poulos, Emanuel & Reed 2010:29). But in most situations the rural radiographic practice appears to be non-specific leaving radiographers confused. The field of conventional radiography as it is practiced particularly in rural radiography units is not similar to other specialised fields such as ultrasound and MRI with clear divisions of the recognised fields (Ferris *et al* 2009:e80). Therefore, it may not be an easy task to delineate radiography competencies especially when one moves from the radiographic theory to practice.

In view of the above, radiographers working in rural areas might need context specific competencies that will enable them to provide an effective diagnostic imaging service even if it might be basic. To this effect, the concepts identified by

Ross (2008:68) as being integral to the practice of a nurse in the rural setting may also be applicable to radiographers working in rural areas of South Africa. These concepts include:

- Maintaining personal and professional boundaries
- Maintenance of values and high standard of patient care
- Commitment to on-going education
- Accepting responsibilities related to the specific occupational context

Research conducted by De Villiers and De Villiers (2004:22) on working conditions in rural hospitals of the Western Cape Province found that a variety of problems encountered by rural doctors required broader knowledge and skills. This could be similar for radiographers in this context. It is therefore imperative for radiography graduates to be fully prepared and equipped by the training institutions to enable them practice efficiently in rural hospitals. Some of the concepts identified by Ross above are discussed in detail under subsections 2.5 to 2.6.

2.4.2.7 Quality of radiographic services in rural district hospitals

The USA's Institute of Medicine (2001:4) states that quality in health services is when the likelihood of the delivered health outcome for the community increases and that these outcomes are in line with the prevailing professional knowledge. The quality of health care services in rural areas faces many challenges. The rural population, for instance, presents a unique and varied need with regard to health care. Literature reveals that in America there is a high rate of chronic conditions in the rural population (Daniels, VanLeit, Skipper, Sanders & Rhyne 2007:62). This means that health care services provided to the rural community must be delivered to the fullest capacity to meet these varied needs. According to Health Systems Trust (1997:1) rural communities in South Africa bear the highest burden of disease mainly because of poverty.

In other words rural communities also deserve quality healthcare service delivered by competent professionals which includes radiographers working in rural areas. Smith *et al* (2009:236) argues that the quality of rural health care may not be at the same level with that which is offered in urban hospitals unless the availability and

accessibility to all health care services, including radiographic imaging delivered by radiographers, is addressed. According to Reid (2006:676) the issues of access to quality health care becomes a defining issue in the context of rural health. However, the challenges surrounding the issues of access to health care by rural communities are not only limited to developing countries like South Africa but also to developed countries (Strasser & Neusy 2010:777). Nevertheless, the view of the National Rural Health Association (2008:4) of Australia is that rural communities also deserve the same access to healthcare like those in urban.

In radiography, the quality of the service rendered is supported by programmes addressing Quality Assurance (QA) which is aimed at the enhancement of patient care with the emphasis on the control of human factors. A competent radiographer is required to assess his/her role in QA because it is inextricable linked to the quality of diagnostic imaging services ((Korir, Wambani, Korir, Tries & Mulama 2013:87). While Quality Control (QC) activities on the other hand deals with the provision of a quality product or service (radiography) that is adequate, dependable and economical with the emphasis on the control of technical factors. Literature suggests that quality health care may be compromised due to low appreciation of quality management in areas such as operational efficiency, film image quality and patient radiation dose (Korir *et al* 2013:84). In view of this, the ability to understand and provide quality diagnostic imaging should form part of the additional core competencies of both radiographers working in rural areas as well as in urban areas.

The quality of rural radiographic service is not limited to technical quality only but it also includes patient satisfaction. The quality of the radiographic service and delivery of the service therefore are closely related but not exactly the same. They are however both required for the purpose of patient satisfaction and satisfaction of other health professionals (Hoe 2007:e24). Therefore, participating in QA and QC initiatives is likely to improve the quality of radiographic services in rural areas and hence bring benefits to both the rural hospitals and their patients.

A competent radiographer must therefore be able to understand the needs of rural patients with regard to quality radiographic service. In some of these rural hospitals, for instance, the radiographer may be both the receptionist and the examiner. In such

situation the radiographer is expected to receive the patient courteously and provide courteous treatment during x-ray examination or ultrasound scanning. This entails that having technical skills alone is not adequate for rural radiography practice.

2.5 THE NEED FOR A FRAMEWORK

In the subsections that follows below the researcher discusses in detail the competency framework which was introduced in Chapter 1 (Figure 1.1) and provides support for the use of the RRCF as the guiding competency framework for this study. The discussion begins with the background information followed by the two frameworks namely the CNO's conceptual framework and the conceptual model of rural and remote allied health competency area.

2.5.1 Conceptual framework in mixed methods research

In mixed methods research like the present one, frameworks could assist with navigations and might also help in the integration of methods (Evans *et al.* 2011:278). A framework may be used as a strategic model that provides an orderly system for the development, management and evaluation of interventions (Bornman 2013).

Initiating a debate involving the development of core competency framework for rural radiographic practice may ultimately result into rural areas having a productive group of diagnostic imaging professionals. In the absence of a common framework one may be required to look at existing frameworks or models with a view of modifying them into a competency framework. The framework may be used to guide this study towards investigation and identification of additional core competencies needed by radiographers working in rural areas of South Africa and proposing a CPD strategy for rural radiographers.

Literature review that was undertaken in this regard was tailored towards identifying theoretical or conceptual frameworks that may be related or with applicability to rural radiographic practice. Despite extensive literature search no framework that captured the role of radiographers working in rural areas of South Africa was found

other than those frameworks describing competencies related to other health professionals (Anema & McCoy 2010:1; Bradshaw 1998:103; CNO 2011:5; Whelan 2006:198;). Most of these frameworks presented by these authors are discussed from the educational perspective.

In a study conducted by Lin, *et al* (2009) it was concluded that the use of competency frameworks in the health circles is still in its infancy especially in the rural context. This argument may explain the lack of literature on competency frameworks for most allied professionals and in particular for radiographers working in rural areas of KZN. Lack of a common shared framework targeted at rural radiographic competency framework, in the context of this study, had impact on this research. A similar problem of non-existent of a common framework, for instance, hampered Shewchuk, O'Connor and Fine's (2005:35) quest to develop a competency model for their study entitled ''*Building an understanding of competencies needed for health administration.''* Non availability of a specific or appropriate framework dealing with competencies needed by radiographers working in rural areas made this researcher to use frameworks related to other health professionals.

In the context of this study, the researcher focused on two frameworks. The first was the conceptual framework proposed by CNO (2011:5). The other one was a conceptual model dealing with rural Australian senior allied health professionals (Lin, *et al* 2009). The identified frameworks will be discussed separately in the following subsections namely 2.5.2 and 2.5.3 below. These frameworks are represented by figures 2.4 and 2.5 respectively. This will then be followed by the discussion of the RRCF (Figure 1.1) which emanated from the modification and integration of these two frameworks. It must be noted however that these identified frameworks are from developed countries namely Canada and Australia. They are not a representation of the South African context and in particular radiographers in rural KZN hospitals.

2.5.2 The CNO's conceptual framework

Jabareen (2009:51) refer to a network of concepts that are interlinked and provides an understanding of phenomenon or phenomena as a conceptual framework. According to Rocco and Plakhonik (2009:126) a conceptual framework plays an

important role in situating the study and thus grounding the study in the relevant knowledge base. The objective of the conceptual framework, therefore, is to help group the concepts, describe concepts that are applicable to the study and map the relationship among these concepts (Rocco & Plakhonik 2009:122). On the other hand, the CNO (2011:4) views a conceptual framework as a way that facilitates dialogue across jurisdictions.

The conceptual framework proposed by the CNO is an entry level to practice for Registered Professional Nurse (RPN). In terms of this conceptual framework, the entry-level RPN is referred to as the initial registration with the CNO by the RPN following successful completion of a nursing education programme (CNO 20011:16). The framework describes skills required by RPN transition from a student to a professional. The CNO (2011:4) proposes a conceptual framework that classifies competencies, for entry level RPN, in four main groups namely:

- Assessment
- Planning
- Implementation and
- Evaluation

According to CNO (2011:4) the framework that categorises competencies allows the nursing process to be embedded in it. The framework is organised into the four major components which form the Nursing Process. The framework further affirms that there is no single competency which is more or less important than another competency (CNO 2011:4). This, according to CNO, is because any competent practitioner may require not only one but an integration of many competencies at the same time for a safe and ethical practice.

The four arrows in the diagram (Figure 2.4) represent the competency statements that describe the expected professional performance and behaviour which reflects the attributes required in a particular nursing role of practice setting (CNO 2011:15). The four main categories must therefore be applied in all competency statements which are represented by the four arrows. For instance, assessments, planning, implementation and evaluation must be applied in the ethical practice. It is also important to note the relationship between the four categories and the knowledge

application at the base of the framework. It shows how the knowledge of these competency statements can be applied in terms of the practice by entry-level RPN (CNO 2011:4). Figure 2.4 below represents the conceptual frameworks for organising competencies for RPNs

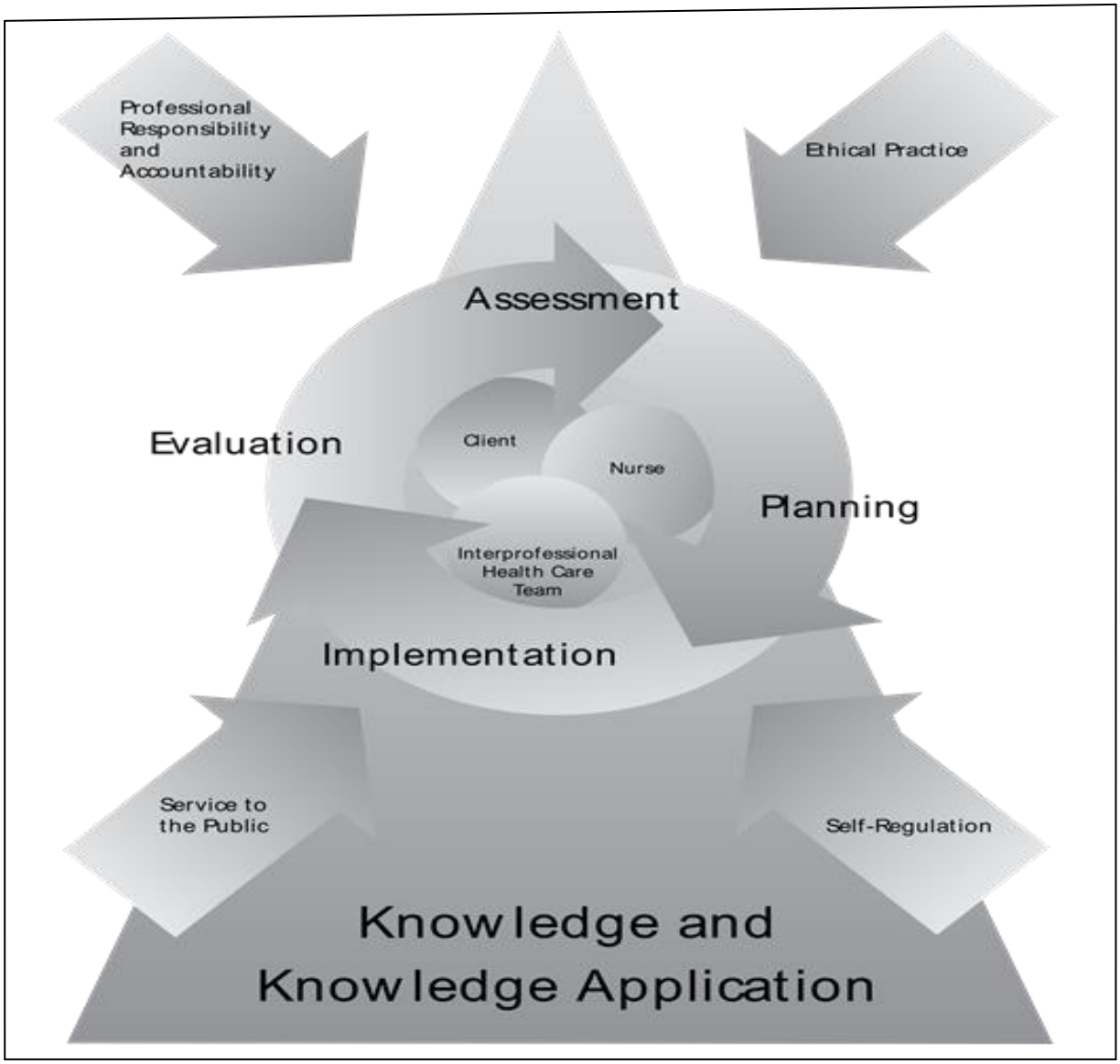


Figure 2.4 Conceptual frameworks for organizing competencies for RPNs
Source: CNO 2011:5

When this is applied to the problem about additional core competencies required by rural radiographers, the application of the knowledge of the competency statements can be used to guide the radiographer to take decisions that are directly related to patient care in the practice of rural radiography. The rural radiographer must acknowledge that decision making in terms of radiographic practice is context

specific. This means that the decision changes according to a given patient's situation and the environment where radiography is being practiced.

In the context of rural radiography practice, ethical practice mean, a radiographer working in a rural area must be competent to be able to demonstrate professional judgments and practice by upholding professional and ethical behaviours. The rural radiographer will apply assessment in the ethical practice by demonstrating the knowledge of confidentiality as it applies to individual patients. With regard to planning, the rural radiographer must plan how to obtain consent from the patient and may be how the patients' information may be shared with the relevant members of the health care team and possibly relatives of the patient. Implementation with regards to ethical practice may be demonstrated by a rural radiographer through provision of care to the patient while being respectful of one's right to information.

Furthermore, the four major categories identified in the CNO conceptual framework for organising RPN competencies are likely to be applicable to the competency requirements of radiographers working in rural areas of South Africa. The premise of the CNO's conceptual framework when viewed in terms of rural radiographic practice means that the individual rural radiographer is part of the rural health care team whose focus is on the patient. Furthermore, it might be important also to consider the overlapping of the central figures namely the nurse, client (patient) and healthcare team, illustrating their interconnectivity (CNO 2011:4). Therefore, in terms of this conceptual framework, the rural radiographer needs to acknowledge the importance of an interprofessional health team which is an integral part of the rural health care practice.

While the practice of RPN requires the integration of many competencies identified in the conceptual framework, it is however doubtful that radiographers working in rural areas are able to integrate many competencies identified in the rural radiographers competency framework (Fig1.1).

2.5.3 Conceptual model of rural and remote allied health competency area

Lin's *et al* (2009) conceptual model proposes three broad domains of competencies

necessary for rural and remote allied health practices in Western Australia (Figure 2.5). These intersecting broad domains, according to the same authors, include:

- Generic competency,
- Professional competency and
- Technical competency.

The above three major domain competency areas emerging from Lin's *et al* conceptual model were found to be relevant to this study. These broad domains are discussed below showing how they may apply to the core competencies required by radiographers working in rural areas. Figure 2.5 below reflects the Conceptual Model of rural and remote allied health competency area.

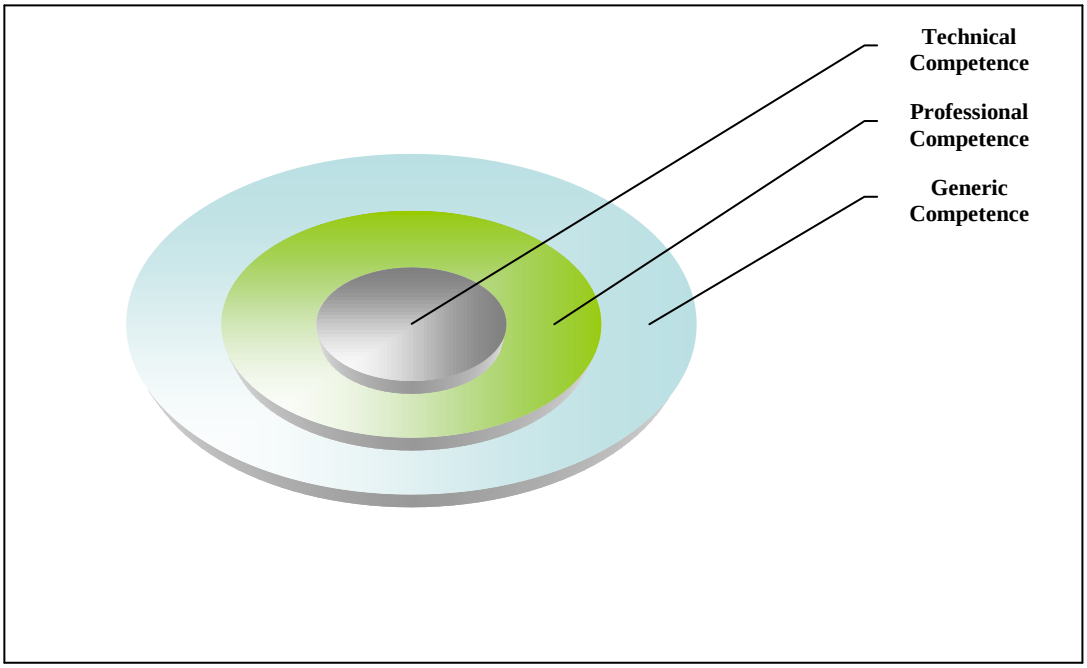


Figure 2.5 Conceptual model of rural and remote allied health competency area
Source: Lin, Beattie, Spitz & Ellis 2009:4

2.5.3.1 Generic competency

According to Lin *et al* (2009), the generic competencies include skills that are shared by health professionals but they are not necessarily specific to health services provision roles. Some of the skills that may be included under generic competencies which are not specific to health care industry alone, though not an exhaustive list, may include leadership, planning, communications, teamwork, problem solving and

interpersonal skills. These competencies such as leadership and management and teamwork are not just associated with business only but transcend the barriers of practice. For instance, leadership is an essential factor because it can have an impact on the way radiography as a service is delivered and hence affect the overall healthcare service within the hospital. Therefore, radiographers working in rural areas of South Africa may be required to develop these competencies to effectively perform as members of the rural health care team.

2.5.3.2 Professional Competency

Professional competency refers to skills that are shared by health care professionals and are required by all health care professionals or specific group, for example nurses, physiotherapists, radiographers' doctors and other healthcare professionals. (Lin, *et al* 2009). In healthcare, these professional competencies are normally used to create boundaries between professional disciplines.

2.5.3.3 Technical Competency

The conceptual model places the technical competence in the middle. These are competencies which describe skills that are relevant to a specific area of discipline or profession (Lin *et al* 2009). In the context of a radiographer working in rural areas of South Africa it means that he/she must be competent enough to perform all traditional radiographic practice such as plain skull x-rays, x-ray examinations of upper and lower extremities, contrast examinations and many more.

2.5.4 Development of a competency framework

The paradigm shift by the South African health authorities towards PHC with a focus on preventive care further provides a challenge for rural radiographers to develop solutions that are change focused. While it may be a challenge in an attempt to identify additional core competencies required by radiographers in the rural context, the benefit of having a common framework may be significant. According to Strasser *et al* (2010:142) this can increase role clarification of rural healthcare professionals and at the same time guiding the training. This is in line with other researchers who

are also of the view that competency frameworks may have many functions in the delivery of quality health care service (Lin *et al* 2009). The current trend, according to Baker (2003:51) and NHS-Scotland (2005:16) is that individual institutions, clinical teams and many professional bodies are using competency frameworks to:

- Map out what professionals contribute towards services
- Identify where opportunities may exist for role development
- Design and develop educational programmes

With regard to work environment, Carrington *et al* (2010:169) noted that competency framework can be used in a number of areas such as:

- Defining the gap in the individuals' skills, knowledge and activities
- Identification of training and development needs
- Supporting selection and recruitment process. For example, identify behaviour traits required for a given job.

To this effect, numerous research efforts in other health professions such as nursing and medicine have been undertaken to define and develop competency models, (Bradshaw 1998:103; Raines 2008:373), but little evidence exists that there is such literature in radiography. The aim of developing a competency framework for radiographers working in rural areas, in the context of this study, is to enhance individual radiographers' effectiveness and may be suggest a CPD strategy that takes into account the needs of these radiographers. It may be necessary to seek the input from institutions, such as radiography training institutions, rural hospitals clinical managers who are directly involved with these radiographers, into the development of a competency framework. This approach is likely to promote consistency among rural radiographic practitioners. This notion is supported by Verma, Paterson and Medves (2006:110) who argue that consensus on core competencies provides a common framework.

It must be noted however that because of the unique demands of practice in rural areas, rural radiographic practice might be even more dynamic. Competencies are therefore likely to change over time in response to the changing health needs of local communities and healthcare environments (Canadian Nurses Association 2010:3; WA Country 2008:2). The development of a competency framework should

therefore accommodate such changes. Furthermore, it should be a framework that is flexible as to accommodate the dynamic rural practice.

The Chartered Institute of Personnel Development (2012) proposes that when developing a competency framework it is essential that only measurable components are included. This therefore means that a competency is a measurable pattern of elements such as skills, knowledge, attributes and behaviours that a radiographer working in rural area may require to perform successfully in the rural setting. The CIPD (2012) further reported the following as some of the typical elements that are included in most employers' competency frameworks:

- Communication skills
- People management
- Customer service skills
- Team skills
- Problem solving skills

There are no standards in place to assist radiographers working in rural areas in carrying out their duties and be able to assess their competencies. A number of competencies-were identified within the body of knowledge but so far there has been almost none that attempts to present a comprehensive framework (Gardner & Boucher 2000:3) particularly for radiographers working in rural areas. This means that a competency framework that defines expected skills, knowledge, attitudes and behaviours for these radiographers does not exist. This may present a challenge to the successful practice of radiography in rural areas and lifelong educational development.

Despite the lack of literature and regardless of the on-going debate for or against competency frameworks, Hendry, Lauder and Roxburg (2007:691), are of the view that education training institutions such as schools for radiography need to be tasked to develop competency frameworks that are in line with the available evidence. A well-developed competency framework for radiographers working in rural areas can therefore be used to identify training needs and hence support CPD programmes at individual and group levels. It may also be used to inform curricular development to some extent.

2.5.4.1 The Rural Radiographers Competency Framework (RRCF)

When one looks at the conceptual model proposed by Lin *et al* (2009) critically, it is important to take note of the use of the terms 'competency' and 'competence.' Lin *et al* (2009) used the terms interchangeably. Furthermore, when one looks at the above conceptual model of rural and remote allied health competency area from the perspective of human performance technology (HPT) the difference between competency models and competence models in their definitions become apparent (Teodorescu 2006:27). The competence model, according to Teodorescu, refers to a framework which defines the process and work results that may be needed to consistently achieve the set goals. On the other hand, Teodorescu (2006: 29) writes that competency models are defined as a framework that lists statements in which elements such as knowledge, skills, critical behaviour and attributes are described.

Despite the differences in definitions between competency and competence models as noted by Teodorescu, a detailed thematic analysis of the conceptual framework proposed by CNO (2011:5) and the conceptual model proposed by Lin *et al* (2009) revealed similarities in the themes and also reoccurring themes. This apparent thematic similarity made this researcher to adopt the two frameworks, combine and modify them. This means that both thematic similarities and reoccurring themes from the CNO's conceptual framework and Lin *et al*'s conceptual model were used to inform the contents of the competency framework (Figure. 1.1). As indicated in Chapter 1, the resulting framework was called the Rural Radiographers' Competency Framework (RRCF). Wuliji (2011:4) describe a competency framework as a collection of competencies that are considered to be important to perform a core set of tasks.

The RRCF consists of the main competency domains that may be acquired by a radiographer for the successful practice of rural radiography. The middle of the competency framework (RRCF) shows the position of the radiographer in relation to the patient and the rural healthcare team. This may reinforce the concept that rural radiography cannot be practiced in isolation similar to the CNO's (2011:4) conceptual framework. Furthermore, the patient-centered practice is reflected in the foci of the competency framework. The framework further confirms that a positive

difference to the quality of rural diagnostic imaging and patient care can be achieved through working collaboratively with the rural health team.

This framework may provide a rational, consistent and practical basis for the purpose of understanding rural radiographers' behaviour at work and the likelihood of being able to succeed in certain roles and in certain environments'' (Bartram 2011:2). Other than guiding the study, this competency framework might assist the researcher in an attempt to propose a CPD strategy for rural radiographers. According to Baker (2003:50) competency frameworks can be used to identify CPD needs of individual employees. It is however important that the balance between present and anticipated future competency needs is taken into consideration when proposing a CPD strategy for radiographers working in rural areas. A good CPD strategy for rural radiographers can assist individual or groups of radiographers working in rural areas to prepare plans for continued education in order to improve or acquire the needed competencies.

The forgoing sections show how the RRCF came about and how the competency framework was going to guide the study. The above discussion also shows that the RRCF (Figure 1.1) is not just a mere diagrammatic presentation of concepts but rather a construct where each listed concept has an important part to play (Jabareen 2009:51). The RRCF also reflects non-clinical competencies that rural radiographers may be expected to develop while practicing in rural areas.

2.6 GLOBAL PERSPECTIVE OF COMPETENCY

The section begins with the discussion about the conceptualization of competency followed by discussion on the competency movement and the use of the concept of competency in healthcare. The last subsection (2.6.3) under this section deals with some of the competencies for rural health workforce.

2.6.1 Conceptualisation of competency

According to Anema and McCoy (2010:5), competency focuses on one's ability to perform tasks related to work and life skills or learning. While Axley (2008:218)

refers to competency as a multifaceted ideology. Extensive review of literature indicates that much has been written about the concept of competency. Fragmentation and differences of ideas and definitions within the body of knowledge appear evident when one examines the literature related to the competency concept (Jasper & Crossan 2012:839). The definition of the concept of competency as deduced from the available literature emerges as a complex task surrounded by significant views.

These various ideas and definitions are bound to cause confusion in the use of this concept. In some instances, such as the study by Davidson (2006:10) in which an attempt to define clinical competencies for newly qualified South African diagnostic radiographers was made, the term 'competency' was used interchangeably with the term 'competence' within the study. Nevertheless, in depth review of literature suggest that the concepts of competence and competency are different hence they may not be used interchangeably. Regardless of this confusion, at the end of the 1980s, Prahalad and Hamel (1990:79) advanced the concept of ''core competencies'' and its definition has contributed immensely to the current interest in ''competencies''

2.6.1.1 The competency movement

Literature suggests that the origins of the competency movement may be linked to the changes in the economic and political context of the late 1960s (Bolden & Gosling 2006:148). In the same line, (Horton 2000:313), is also of the view that the driving force behind the competency movement is the increasing new business and human resource agenda which is aimed at delivering a competitive business performances. According to the same author, the involvement of public sector management in the third international 1998 London conference on competency confirms the importance of competency and that it cuts across the market divide. However, the 1998 international London conference on competency reviewed how wide and perverse competency idea has become around the world (Horton 2000:306). The diversity of the definitions, arguments and school of thoughts just confirms the complexity and the multifaces of the term 'competency.'

In recent times there have been a growing awareness and acknowledgement that successful job performance requires a mix of behaviour, attitude and action (CIPD 2012). In the same vein some authors have described competency as a combination of knowledge, skills, attitudes and the individual professional's ability to perform clinical practice (Cowin, Hengstberger-Sims, Eagar, Gregory, Andrew & Rolley 2008:273). However, CIPD (2012) argues that this viewpoint has resulted in the use of two terms ''competence and competency'' interchangeably more often.

From the above discussion, one is made to conclude that the term competency refer to an input that encompasses knowledge, skills and behaviours that a person such as a radiographer brings to the job. This then becomes relevant in the context of radiographers working in rural district hospitals of KZN were the researcher has made assumptions that these radiographers lack additional core competencies that may enable them to perform to the required expectations of the hospitals and more importantly the expectation of communities they serve.

2.6.2 The use of the concept of competency in healthcare

In the context of South African radiography, an exhaustive search of South African Qualifications Authority's (SAQA) web pages on the National Qualification Framework (NQF) register found no mention of the concept of competency in both the Bachelors and Masters' degrees for radiography (SAQA 2014). One is left to assume that this confusion maybe a reason contributing to the lack of specific literature with regard to competencies required by radiographers working in rural hospitals of South Africa.

Elsewhere the concept of competency, according to Axley (2008:215), was introduced in the 1990s as a strategy of evaluating, nursing students and other healthcare providers in the USA. With regard to radiography, this is reflected in the 2012 radiography didactic and clinical competency requirements for the radiographers in the USA (American Registry of Radiologic Technologists 2012). Other authors, such as LaDuke (2001:221), have however expressed concern that the use of competency in the healthcare lexicon may not be easily understood either in or outside the industry. This view is supported by Scott Tilley (2008:58) who further

argue that even though the concept of competency has become important in the healthcare industry there is no common understanding of what it is. This lack of common understanding may have prompted Bolden and Gosling (2006:150) to raise significant concern about the effectiveness of competencies on improved performance at individual or institutional level.

Nevertheless, the dramatic growth and expectation of community interest in health has influenced the development of core competencies in health (Verma, *et al* 2006:109. There may be uncertainty with the definition of radiography competency and in particular core competencies required by radiographers working in rural areas whereas there is at least a vague and broad definition of competency for other health professional such as nurses (Bradshaw 1998:103). It may be challenging to define core competencies needed by rural radiographers but the reward of having standardised and common core competencies that encompass the skills necessary for rural radiography practice is significant (WA County Health Service 2008). Regardless of the confusion surrounding the definition of competency, literature suggests that one needs the context in which the concept should be applied (Shewchuk *et al* 2005:35).

2.6.3 Competencies for rural health workforce

Lack of additional competencies required by rural radiographers to perform effectively may result, for instance, in lack of courtesy to patient and poor patient care such as failure to provide timely examination or respecting patient's cultural beliefs. It is imperative that radiographers working in rural areas possess both clinical and non-clinical (generic) competencies. For instance, working in rural areas requires collaboration with other health care members in order to achieve the desired outcome. Having additional core competencies, other than those obtained a point of graduation, will therefore assist individual radiographers respond effectively to rural working environment just as they have responded to technological changes in radiography. Therefore, the importance of determining and identifying the competencies needed by radiographers working in rural areas need not to be emphasized. Of late there has been an international focus on the needed skills and competencies for health care workers (Lin *et al* 2009). The emphasis on competency

may partly be attributed to factors such as users of rural health care raising concerns about the quality of the services they receive.

The working environment in rural areas is very different in many ways from that in urban hospitals. This is echoed by Cooke *et al* (2011:114) who write that the skills requirements for an urban district hospital are different from those required by rural district hospital. In many instances the workload for radiographers working in rural areas is heavier and more demanding because it spills over the traditional boundaries and unformulated scope of radiography practice. This, according to Minisini *et a.* (2011:1), is further challenged by the problems of an unstructured and poorly supportive workforce. Writing in the 2011 South African Health Review, Cooke *et al* (2011:108) also noted that urban healthcare is well organised and supported as compared to rural healthcare. These authors further noted the uniqueness of rural healthcare with respect to human resource and bemoaned the absence of acknowledgement by different policy initiates.

The role of a rural radiographer requires integration of clinical and non-clinical skills. The combination of radiographic skills, rural experience and knowledge of the community is required to offer effective radiographic services in these rural district hospitals and must not be underestimated. Furthermore, radiographers in rural hospitals must be aware that participation in PHC extends beyond the confines of their x-ray departments and involves activities such as budgeting, cash-flow meetings, human resource planning and recruitment and so on and so forth. Unfortunately this expanded role has never been recognised and as such training has never been expanded to include such competencies. This however is in sharp contrast with nurses working in PHC whose expanded role has long been recognised (Strasser *et al* 2005:134).

This uniqueness may require additional training of health professionals posted to rural areas. In the case of radiographers, Smith and Hays (2004:69) explain that the scope of radiography practice is affected by the place where one practices. This may be true, in the context of South Africa, where the scope of radiography practice in rural hospitals appear to extend beyond traditional duties in x-ray departments onto other departments. Literature indicates that in rural and remote areas of Australia

where there are often no radiologists, radiographers are called upon to assist doctors in the reading of radiographs (Smith *et al* 2009:2). This responsibility is traditionally not part of the scope of radiography. In this regard, McNinch (2004:24) writes that it may be difficult to understand the vital role that these radiographers working in rural areas play unless one has worked in both environments. The diverse nature of rural radiographic practice creates increased need for radiographers to assume responsibility and at the same time show a degree of competency. Cooper (2009:502) notes that diversity challenges the health care system and, in particular rural radiographers, to provide a service that meets the demands of the patients and the community at large. The study done by Gqweta at PHC facilities in urban setting found that radiographers were willing to redefine their roles within the healthcare team to address the challenges (Gqweta 2012:25).

In the same vein some authors have noted that the possible benefit of identifying competencies is the possibility of developing new roles and increased efficiency of health care professionals (Lin *et al*. 2009:2). Radiographers posted to rural hospitals thus need to be prepared for the demands of rural working environment. They need to possess additional context specific competencies that will enable them to adapt to the rural setting without compromising the quality of radiographic services. Tan-Liang, Reed and Agudera (2010:22) add that rural practice requires a radiographer to be an autonomous and accountable clinician.

As mentioned earlier, because of the unique characteristics and the diverse nature of rural radiography practice, it is imperative that radiographers working in rural district hospitals are competent and must exercise a high level of proficiency. This is further compounded by the advent of NHI which government intends to roll out to all public hospitals. Rural health care professionals will be expected to deliver quality health care services that are reliable. This shall therefore demand greater competency and accountability by all health professionals working in rural areas including radiographers. Thus, the sustainability of rural diagnostic imaging, according to Barry (2008:56), depends on having a knowledgeable, skilled and informed radiographic workforce. This implies that as providers of diagnostic imaging in rural district hospitals radiographers requires a comprehensive knowledge of their skills and that of the communities surrounding their institutions.

Furthermore, it must be noted that development and sustainability of radiographers who are competent to deliver rural diagnostic imaging is not only dependent on one having core clinical competencies. According to Carrington *et al* (2010:177), it requires that both the employees (radiographers) and managers accept that competency is the key to the provision of quality healthcare.

Identification of additional core competencies needed by rural radiographers should be supported by a clear value proposition which highlights the benefits to such approach. This approach should be aimed at;

- Improved patient care through the flexibility of radiographers working in rural areas
- Availing potential for inclusive rural healthcare and provision of patient-centered diagnostic imaging
- Increased focus on teamwork and patient-centered service by radiographers working in rural areas.

2.7 SOME OF THE ADDITIONAL CORE COMPETENCIES THAT MAY BE REQUIRED BY RURAL RADIOGRAPHERS

Even though there is very little literature on additional core competencies required by radiographers working in rural areas of South Africa, there is a lot of literature related to other health professionals such as nurses and doctors that may be drawn upon to research the background of what may be the additional core competencies for rural radiographers. There is a need to identify context-specific core competencies that may be needed in rural radiographic practice and hence specify situational constraints which may prohibit rural radiographers from delivering quality diagnostic radiographic service that is needed. Identifying core competencies that may enhance quality of rural diagnostic imaging will be vital in the quest to propose a CPD strategy that may be used to improve competency levels of rural radiographers and by extension contribute to the quality of rural health care.

Below are some of the broad competency categories identified within the literature that could be fundamental requirement for rural radiographic practice. While the list

provided below is in no way exhaustive, it does however include additional core competencies that radiographers may require to practice efficiently in rural district hospitals. Suffice to say that some of the following competency areas may or may not have been included in the radiography pre-service training curriculum:

- Technical skills
- Clinical skills
- Clinical management
- Teamwork and collaboration
- Problem solving skills
- Critical thinking
- Ethical and legal aspects of rural radiography practice
- Leadership in the rural context
- Communication
- Information management
- CPD

The above listed competency areas are each discussed in detail below.

2.7.1 Technical skills

Core competencies have been described as a group of skills or procedures of an individuals' ability to successfully or competently perform the requisite action (Axley (2008:216). According to Lin *et al* (2009), clinical or technical competency refers to specific skills that may be relevant to a specific context or job and in this case radiographic practice. The prevailing understanding currently is that the current radiography training programme on offer in South Africa is sufficient to enable radiographers perform clinical duties in any given environment. This is the view of the SAQA (2014) which states that a qualified radiographer is a competent learner who has the knowledge and skills needed for radiography profession. This assumption is echoed by Tan-Liang, Reed and Agudera (2010:22) who confirm that after fulfilling the requirements set by the training institutions radiographers are deemed qualified practitioners. However, the current practice of rural radiography

and rural health service in general suggest that making such assumptions maybe incorrect and inappropriate (Eley, Young & Shrapnel 2008:12).

For in instance, one technical area where a young radiographer working in rural areas may face challenges is certain plain x-ray examinations such as the skull x-ray. Recently, there has been an increase in the use of computed tomography (CT) scanning for head injuries in almost all tertiary hospitals where practical training for radiographers takes place. This, according to (Mackay *et al* 2008:230), may reduce graduates' hands on experience. This situation as pointed out by these authors may have clinical implications when these graduates are posted to rural hospitals where until now all examinations are done using plain x-ray. Suggestions have been made for practical training, such as the use of scenarios where a patient requires a plain x-ray of the skull to mitigate for this challenge (Tan-Liang *et al*. 2010:25).

Furthermore, with the advanced technology in radiography most big urban hospitals have machines for full body scan. In contrast, rural district hospitals still use conventional equipment and it is upon a radiographer to possess basic practical skills to be able to operate old conventional equipment. Mackay *et al* (2008:230) write that a radiographer should be able to adapt and perform plain x-ray film according to the needs of the patient in the context of trauma for example. It is important that graduate radiographers have the knowledge of all available modalities despite the rapid technological changes taking place in radiography. This is because graduate radiographers may find themselves working in an x-ray department which still uses analogue film system such as rural areas or digital or a combination of both in the case of urban areas (Bontrager 2010:36). Unfortunately many universities no longer cover in detail equipment such as analogue even though it is still used in rural hospitals.

In the absence of advanced imaging modalities such as CT and MRI and limited use of laboratory testing in rural setting, ultrasound is often the available imaging besides conventional x-ray (Heller, Goblirsch, Wallrauch, Lessells & Brunnetti 2010:e108). According to these authors, patients who require CT or MRI are referred to regional or provincial hospitals though this option is in many instances hampered by factors

such as distance and limited appointments available. In such instances, Heller *et al* (2010:e110) argue that ultrasound becomes feasible in the help to diagnose TB of the abdomen in most HIV infected patients.

The issue of additional core competencies required by radiographers working in rural hospitals therefore hinges on what makes a competent radiographer and how he/she is prepared for rural setting. The concept of rural radiography as just a simple combination of technical skills and knowledge should therefore be challenged.

2.7.2 Clinical skills

The radiographer working in a rural hospital must be able to adjust patient care in line with patients' physical or mental disability. For example, having skills in basic skeletal interpretation as a rural practitioner can in many instances make a radiographer to initiate further projections based on the results of the initial examinations. According to Snaith and Lancaster (2008:151) radiographers have even gone further by asking patients about clinical history and even limited examinations of the affected area. This may be beyond the scope of their undergraduate training but a necessary competency in rural set up. In the same way nursing is demonstrated and defined, radiography professionals working in rural areas too, should be defined in terms of patient care including broader notions of professional development and competency (Dunn, Lawson, Robertson, Underwood, Clark, Valentine, Walker, Wilson-Row, Crowder & Herewane 2000:340).

2.7.3 Clinical Management

2.7.3.1 Patient-centered radiography practice

Patient-centered practice requires that radiographers working in rural areas as service providers understand their obligations towards their patients but also know their rights. This entails that radiographers must ensure that radiographic service is delivered in the best interest of patients (Etheredge (2011:12).

One way of enhancing a patient-centered model of healthcare among radiographers

working in rural areas is by identifying clinical practice skills and then improving those that need improvement (Lovell & Lee 2012:40). Other authors have suggested that radiography training institutions must review and adjust curricula to enable graduates to adapt to the demands of patient-centered healthcare (Gqweta 2012:25) Just like any other rural health practitioners, radiographers are also responsible for efficiency, effectiveness and compassion care of patients. This means that rural radiographers must be actively involved in the search of new evidence within the parameters of rural radiography.

The competency of patient-centered radiography practice may require the radiographer to first understand the cultural background of a given area in which the radiographer practices. This may play a role in helping the radiographer to effectively communicate with the patient and thereby providing quality health care (Hurme 2007:42). It is argued by this author that it is also relevant in rural communities where the majority of the population is less educated.

2.7.3.2 Evidenced-based practice

Recently evidence-based practice (EBP) in health care has been adopted by many health disciplines. To become a skilled practitioner in EBP radiography practice, competency is required in critical assessment of the available literature (Hafslund, Clare, Graverholt & Nortvedt 2008:344). However, EBP is an area which does not receive attention in the pre-service training of radiographers.

Radiographers working in rural areas must be competent in the use of available evidence to foster quality diagnostic imaging. It is important for these radiographers as part of the rural health care team to embrace EBP to update and improve individual knowledge in order be able to inform their hospitals about the best practice available according to the latest evidence. To this effect, Hafslund *et al* (2008:344) maintain that a systematic method is needed in EBP radiography. A six step procedure is proposed in this regard. Figure 2.6 below illustrates the integrated steps to evidence based practice.

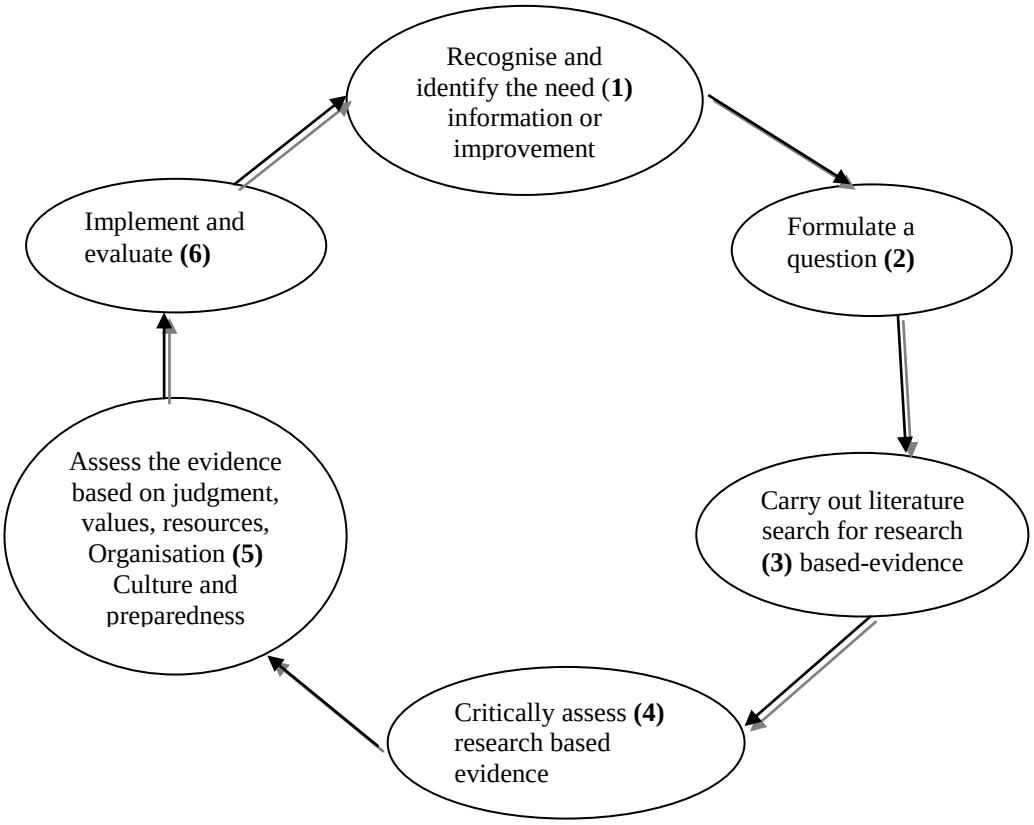


Figure 2.6 Integrated steps to evidence-based practice

Source: Hafslund, Clare, Graverholt & Nortvedt (2008:345)

Other than not being skilled in the use of EBP, it may also be challenging to most rural radiographers because most of the available evidence has been developed and written for urban settings. This may be seen by radiographers practicing in rural hospitals as having little relevance to their working environment. Unfortunately EBP in radiology has received limited attention (The Evidence-Based Radiology Working Group 2001:566). The assumption is that in the context of South African radiography training and practice, evidence-based care has not yet been fully established and hence its promotion is still far behind other health professions in the developed countries. In countries such as USA Occupational Therapy (OT) for instance has been cited as being strong in the development of databases and evidence-based tools (Blagg 2009).

Another factor that may affect the use of EBP by rural radiographers is low competency levels and lack of knowledge. A study carried out by Upton (1999:82) in the UK revealed low level of knowledge among the sample of radiographers about

the concept of clinical effectiveness and EBP. Mastery of this competency though not traditionally part of the scope of radiography practice is likely to help optimize the delivery of rural radiography.

2.7.3.3 Interpretation of x-ray images and ultrasound scanning skills

Poulos (2011:3) observe that reading of radiographs by non-radiologists such as GPs is acceptable but the absence of medical education is viewed as a major obstacle for radiographers to be allowed to interpret x-rays. This, though, is against the background that in the rural clinical set up, radiographers work closely with doctors and their opinions on x-rays are sought on daily bases because there are no radiologists.

The shortage of radiologists in rural hospitals is not only a problem unique to South Africa but is also a problem in the developed countries like Scotland (Howard 2013:137). In the absence of digital radiography in rural areas means reporting on radiographic images by radiologists is delayed in rural areas since there are no radiologists on site (Squibb, Bull, Smith & Dalton 2015:25). Thus, developing a competency in, for example, musculo-skeletal image interpretation by radiographers working in rural areas is likely to benefit the rural hospitals and the patients in particular. This extra responsibility may entail redesigning work roles for rural radiographers aimed at increasing their capabilities and thereby adjusting to the on-going needs of rural healthcare (Hardy *et al* 2010:29).

A study conducted in North-East Scotland suggested that radiographers commenting on musculo-skeletal images are likely to streamline patient healthcare pathways (Howard 2013:137). The situation at present is that clinician and patients alike do ask radiographers' opinion on radiographic images. This is evidenced in the results of a study conducted by the professional board of Radiographers and Clinical Technologists (RCT) under the HPCSA (2014) which showed that 81.6% of the radiographers reported that referring clinician ask for their opinion on x-rays. However, most of rural radiographers here in South Africa and elsewhere are not allowed by law or training to read and report on radiographs (Smith, *et al* 2009:1). In the context of South Africa, the Health Professions Act No.56 of 1976 allows the

radiographer to discuss the results of a radiographic image with the referring clinician only (Gqweta 2012:22). In countries like Australia a radiographer is described as a healthcare professional who provides and interprets a range of medical imaging examination (AIR 2009:4). The role of radiographers in this context, according to Suibb *et al* (2015:25), is ambiguous and may have particular implications for those in rural areas.

Nevertheless, a study done in the UK on reducing errors in the reading of radiographs in accident departments found that 28 radiographs which were misinterpreted by casualty department doctors were correctly interpreted by radiographers (Berman De Lacey, Twomey, Twomey, Welch & Eban 1985:421). It could therefore be of value if interpretation of radiographs could become a recognised competency of radiographers particularly those working in rural hospitals where there are no radiologists.

Expansion of diagnostic services such as obstetric ultrasound to the community is another area which may benefit from recognizing basic obstetric scanning as a competency required by rural radiographers. This will fit into the KZN department of health's drive which aims to bring services closer to the people. By doing this, for instance, radiographers will be contributing towards the reduction of avoidable obstetric emergency care use of hospital (Cliff 2012:234). This additional competency can only be relevant to rural radiographers as opposed to their counterparts in urban hospitals where they have sonographers. Some radiographers have expressed concern on expanded roles but research has shown that skills-mix is valued by many radiographers (Lumsden & Cosson 2015:61).

2.7.4 Teamwork and collaborations

The emphasis on teamwork in rural areas lies in the realization that no individual health discipline alone can provide and meet all the needs of patients. This implies that no single health care professional can provide a comprehensive rural healthcare package alone. Rural healthcare practice rely heavily on multi-disciplinary collaboration and radiographers may be required to give input, for instance to doctors, on their field of expertise. Similarly, Kim, Kim and Kim (2011:201) view

the hospital as a complex organisational structure where workers possess different competencies in a wide range of areas. In a multidisciplinary approach these different experiences and expertise are harnessed to provide comprehensive healthcare.

To this effect, Leggat (2007) is of the view that since patients' outcome rely on effective multidisciplinary effort, it is important that healthcare professionals are well prepared for teamwork environment. The ability of a rural radiographer to work with other health professionals can therefore be considered as a critical factor of professional practice that may need specific competencies (Suter Arndt, Arthur, Parboosing, Taylor & Deutschlander 2009:41). The ability of a radiographer, working in a rural district hospital, to work within the multi-discipline health care team to deliver a patient-centered diagnostic imaging requires a specific set of competencies (Suter *et al* 2009:41). Good team work skills are needed and this may require a well-trained graduate radiographer.

In radiography, issues such as low self-esteem and resistance to change have been identified to characterize the culture within the radiography profession (Yielder & Davis 2009:345). It is, however, important that radiographers working in rural areas of South Africa to realise that there is no total autonomy. The autonomy of any profession according to Sim and Radloff (2009:204) is relative while some maybe more autonomous than others. In addition, these authors are of the view that the multidisciplinary health care teams of which rural radiographers are part of should not be defined by the profession but by the comprehensive set of competencies and skills that can be used to best deliver and meet the needs of the rural patients.

Mastery of the competency of team work by radiographers working in a rural environment is important as it helps them to communicate with other members of the health care team. Both rural district hospitals and radiography training institutions may play an important role in ensuring that radiographers are equipped to enable them participate fully in the rural workplace teams. For instance, interpersonal relationship within team environment could be natured and facilitated through meeting briefings and introductions (Williams, Widdowfield & Casson 2015:166).

2.7.5 Problem-solving skills

According to Chi and Glaser (1985:229) a situation where one is trying to reach a goal or an objective and must find a way of how to get there is referred to as a problem. Radiographers working in rural areas encounter numerous problems from within and outside their x-ray departments. For instance, there may be a complaint from doctors that x-ray requests for patients, who are admitted, are not attended to promptly and this is impacting on the process of clinical management of these patients.

The rural radiographers need to analyse facts about the situation and use these facts to come to a conclusion of the problem. This means that the radiographers working in rural areas of South Africa need not only recognise that there is a problem but also be able to solve it. Literature reveals that developing expertise in problem solving is important as it is essential to the success of human activities (Nokes, Schunn & Chi 2010:265). Therefore, working in rural hospitals may demand problem-solving abilities, because repetitive automatic action or pre-programmed type of radiography may no longer be enough.

2.7.6 Critical thinking

Turner (2005:48) describes critical thinking as one's ability to analyse assumptions, be able to change the status quo while at the same time recognizing limitations in health care and be able to take remedial steps to improve it. Literature reveals that critical thinking is one of the key areas of competency listed by academic programmes in health administration (Molly 2002:90). This may not be the case with radiography training programmes in South Africa. Unlike in urban hospitals where a radiographer maybe allocated to a sub-specialisation like CT scanning, in rural district hospitals of KZN a radiographer is expected to do all general diagnostic imaging. In other words the radiographer in a rural hospital is expected to assume multiple duties, and be able to adapt to the environment and working culture. In rural areas radiographers are required to make independent decisions. In order to do so one is required to possess technical and clinical skills and critical thinking abilities. In the study on competencies of rural nursing, Hurmel (2007:2) reported that rural nurses

need to adapt to change and therefore need the ability to think critically.

Despite the importance attached to critical thinking as a core competency, literature in radiographic circles is limited on that aspect. In the world of radiography lack of critical thinking appears to persist which, according to Gosnell (2010:2), is due to the fact that radiographic practice continues to be protocol driven. This view is shared by Sim and Radloff (2009:206) who writes that the protocol driven culture of radiography practice is bound to discourage radiographers from reflection and critical thinking. Rural radiographers could benefit from critical thinking as an additional competency. This can only be achieved by adequately preparing student radiographers to demonstrate critical thinking in the work environment. In fact some authors have argued that the modern hallmark of a well-prepared graduate is the ability to think and act in different situations (Bell, Walker, Allen, MacCarrick & Albert 2010:31). In the context of rural setting, critical thinking will enable the radiographer to do the right thing for the right reason, which includes recognition of problems, differentiating between priority and urgency (Whelan 2006:200).

2.7.7 Reflective thinking

Even though reflective thinking as a competency is regarded as important, literature in the context of radiographic science is scarce. This is reflected in the graduate radiographers who appear to be abreast with the technological advances but show less competency in the area of reflective thinking (Baird 2008). It has been noted by authors such as Yielder and Davis (2009:345) that there was need for formal training programmes to emphasis on reflective thinking. This argument is supported by Baird (2008) who suggests that radiography curriculum should not only concentrate on developing graduate radiographer's biomedical knowledge but also reflective thinking. In the context of rural radiographers it may be important to afford them an opportunity to learn how to adapt and adjust to the rules governing radiography practice to fit in a given problem.

2.7.8 Ethical and legal aspect of rural radiography

Although informed consent and confidentiality apply to research in general, the two

ethical considerations occupy special space in the medical field as explained below.

The complexity of the radiographic field in South Africa brings to the fore a multitude of ethical issues (Etheredge 2011:10). Ethical and legal aspects are regarded as very important in the practice of radiography. Other than having core radiographic knowledge and skills and be able to perform radiography competently, all rural radiographers need to understand ethical and legal consequences associated with their practice.

The scarcity of literature regarding radiographers' attitude towards ethics, the understanding of the ethics and ethical conduct especially those in rural hospitals is not limited to South Africa only but also in the developed world such as Australia (Lewis, Haard, Robinson, White & Poulos 2008:91). Nevertheless, it is important that information regarding ethics and legislation is made available to enable rural radiographers perform and act in the best interest of the patients they serve. The rural radiographic practice, for instance, requires a radiographer who is competent enough to know the limits of the practice, know when to refer the patient to another health professional and when to seek advice. In situations where the interests of rural radiographers are considered, ethical issues, which do not receive much attention during training, can be some of the activities that maybe covered when developing CPD programmes.

2.7.8.1 Informed consent

Informed consent from the patient is required before any medical treatment or procedure. This entails that radiographers working in rural district hospitals need to take into account patients' wishes in the process of decision making. The patient must be regarded as an autonomous agent and hence must have the right to full information and self-determination. Colyer (2007:198) noted that it is vital to provide enough information as a way of respecting patients' right to be informed. According to the same author, giving sufficient information to the patient is a fundamental aspect of the concept of informed consent. Consent can be given either verbally or in writing. Regardless of the method used to obtain it, true consent is when the patient is able to understand fully what is involved in the procedure

including benefits and risks of the given procedure (European Society of Radiology 2013:155). This, then, suggests that it is the responsibility of a rural radiographer to provide sufficient information to enable the patient to make an informed decision with regard to the x-ray examination. However, evidence from literature suggest that South African radiographers especially those in rural district hospitals do not have access to interpretive resources (Etheredge 2011:11).

Informed consent has been confusing within the radiographic fraternity both rural and urban. Yet a study done in the United Kingdom showed widespread implementation of radiographer-led consent in a number of hospitals (Colyer 2007:197). In contrast, radiographers in South Africa find themselves in a dilemma on the issue of when to ask for patients' consent. The question that is most likely to be asked by the radiographer is whether the referring clinician did obtain consent from the patient for a radiographic examination beforehand (Etheredge 2011:12). In the context of those working in rural hospitals, the problem is further compounded by patients who are less-educated. In such cases communication becomes a challenge. This is because the National Health Act No.1 of 2003 requires that the patient must be able to understand and participate in discussions before he or she can give consent for any health service to be given (South African Government 2004).

2.7.8.2 Confidentiality

Throughout radiography training confidentiality is emphasized as an important component of health practice. In terms of radiographic practice, radiographers are not allowed to discuss with the patient the pathology that may be on the radiograph (Etheredge 2011:11) However, in the context of rural settings confidentiality for both patients and health care providers is impacted upon by social relationships (Bourke, *et al* 2004:182). Sometimes patients' relatives will ask the radiographers after taking the x-ray to tell them what was wrong with the patient. In many instances rural radiographers may not be well equipped to properly handle such requests which may hinge on ethical or legal issues.

2.7.8.3 Performing radiographic duties that are not traditionally performed by radiographers

As members of the multi-disciplinary team, rural radiographers perform extra duties which in many cases are outside traditional diagnostic image production. The traditional duties of rural radiographers include production of diagnostic images using general x-ray equipment, CT or MRI and performing QC activities. Due to shortage of sonographers most rural hospitals allow diagnostic radiographers to perform basic obstetric and abdominal ultrasound with no formal but short course training. They are asked for their opinions not only on ultrasound but also on the x-ray images they produce. Addition of responsibilities which are outside the traditional radiographic domain comes with ethical and legal accountability (Alderson & Hogg 2003:305). Literature reveals that by doing the actual examination, it is an example of tacit of knowledge (Larsson, Lundberg & Hillergard 2009:e12). There are a number of legal and ethical issues that may arise from carrying out these clinical responsibilities. Some of those identified by Alderson and Hogg (2003:305) include:

- In the case of ultrasound, failure to detect foetal anomalies while undertaking ultrasound scan.
- In the case of x-ray, one may cause injury during a special examination for example barium studies.

It is therefore essential that radiographers working in rural areas understand the basics of ethical and legal system associated with their practice. It is the same view held by the HPCSA under which radiographers are registered which regards a good health practitioner as someone with sound professional and ethical practices (HPCSA 2008:3). A rural radiographer must therefore be competent to enable him or her to provide quality patient care and management. Hardy *et al.* (2010:29) suggest that the extra responsibilities inherently increase the need for multi-skilling radiographers working in rural areas so as to improve their capabilities to meet the needs of the rural communities. In the case of ultrasound, for example, it can be useful in trauma cases. Ultrasound may be used to guide rural doctors' decision on when or how to evacuate a patient to 2nd level hospital (Sounes, Huges & Winzeberg 2008:2).

Another study done in South Africa concluded that ultrasound examination may reduce delays in the initiation of TB therapy thereby limiting disease transmission (Patel, Beningfield & Burch 2011:41).

Basic ultrasound scanning may not have been included in the pre-service training but the forgoing subsection shows that it may be an additional core competency required by radiographers working in rural hospitals. In the context of nurses, Pearson (1993:215) reported that some nursing organisations in Australia have been advocating for nurses to legitimately extend their roles.

2.7.9 Rural radiography and leadership

Leadership may or may not have been covered in the pre-service training of radiographers but it is an essential trait in rural areas where there are no radiologist to lead x-ray departments.

Radiographers are considered as professionals in the clinical field but they are also required to participate in leadership practices. According to Baker (2003:49) good leadership is needed in health and in particular in rural radiography just like in any other areas such as business. Rural radiographers are thus expected to understand the complex pathways and systems of healthcare delivery if they are to function effectively (Hall, Moore & Barnsteiner 2008: 417; Swanwick & McKimm 2011:22). Radiographic leadership is an essential factor in meeting hospital and in particular x-ray department's objectives. This, then, means that the effectiveness of radiographers in a given x-ray department may differ according to the objectives set for a given radiographic unit and leadership style in that unit. Leadership and management competencies are, according to Molly (2002:89), core competencies such as mentoring, team building and conflict resolution. Yet, there is very limited literature regarding the skills, knowledge and attributes that are required to be an effective radiographic manager (Gardner & Boucher 2000:3). On the contrary, a great deal of work has been done in identifying leadership and management competencies for other health professionals such as nurses (Cameron, Harbison, Lambert & Dickson 2012:1469; Jasper & Crossan 2012:838;).

Radiographers in rural KZN district hospitals are expected to be leaders in their professional environment. This is one of the differences between rural radiographers and their counterparts in the urban areas where other professionals such a radiologist have overall responsibility for x-ray units (Smith & Hays 2004:69).

Rural radiography leadership thus needs to understand both internal and external factors that influence the practice in their work setting. Bolden and Gosling (2006:151) warns that leaders of rural radiography units need to consider the broader leadership role. Also of importance are factors such as organisational systems, nature of the work and the cultural environment. Unfortunately obtaining leadership competencies for the clinical setting is not necessarily part of the radiographers' training (Oslen & Neale 2005:1219).

The commitment, loyalty and job performance by leaders of radiography in rural areas may be affected by lack of experience and the institutions' culture. A study that explored leadership in community nursing teams in the UK revealed that experience was regarded as more important than one's grade (Cameron *et al* 2012:1474). If this is translated into radiographers' terms for the South African context, it could mean that a Grade 3 radiographer at production level with more years of service will be perceived as better placed to be a leader than a chief radiographer grade 1.

Leadership traits are some of the competencies which traditionally may not be associated with radiography but unique to rural radiographic practice and represent additional responsibility and technical competency which according to Hardy and Snaith (2006:328) are beyond those expected at the point of registration. This statement may be true with the majority of radiographers working in rural areas of South Africa many of which may not have had the chance to develop and consolidate such competencies.

2.7.10 Management of radiographic units in the rural context

In the experience of the researcher, in institutions were staff compliment of radiographers is sufficient, senior radiographers are required to provide effective management to the department. The management duty could further include clinical

facilitation to newly qualified radiographers over and above managerial skills. It implies that a rural radiographic manager must possess clinical facilitation skills to fit the job description. The assumption is that management competencies by rural radiographers may be lucking since junior radiographic managers may in additional to training skills, luck line managers to mentor them.

In the case of the UK, this challenge has since been identified and remedial solutions in the form of ‘‘four-tier model’’ practice have been put in place. In this four-tier model the most senior level is for a consultant radiographer whose duties are purely management (Woodford 2006:320). Figure 2.6 reflects a Four-tier model for the UK radiographers.

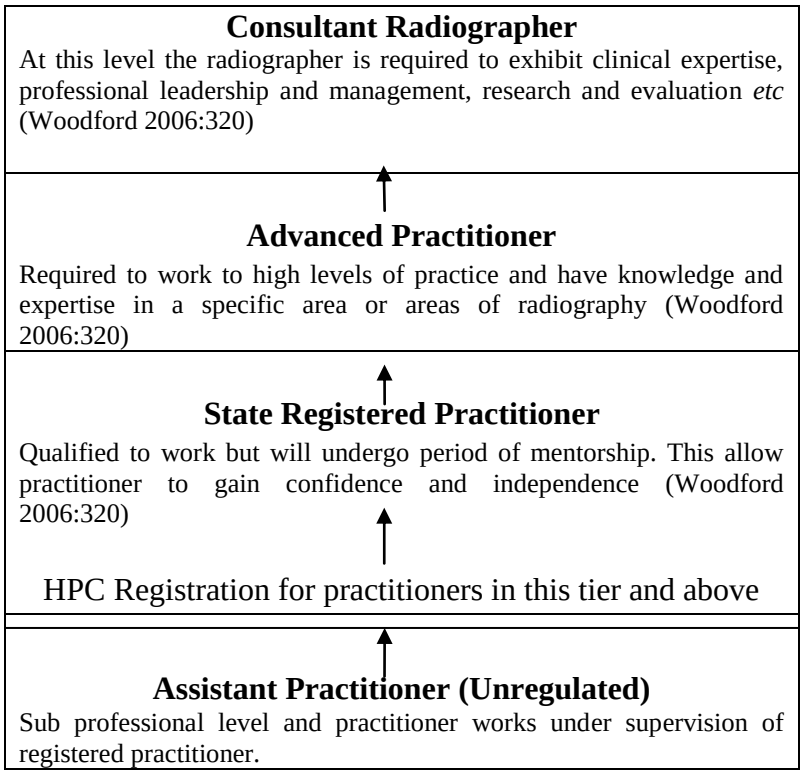


Figure 2.7 The four-tier model for the UK radiographers
Source: Price, RC. 2006:29

A similar ranking but with different titles has been implemented in South Africa (Figure 2.8). In the South African set up, the senior most radiographer (Assistant Director) is not there for purely management purposes only. The Assistant Director (AD) is expected to do basic radiographic duties on a daily basis. The AD is also expected to be innovative, resourceful and independent. The AD rank is however

dependent on the size of the hospital. Hence, not all Level 1 district hospitals have the post of an AD on their institution's staff establishment. Figure 2.8 below represents what can be called the South African version of a four-tier model.

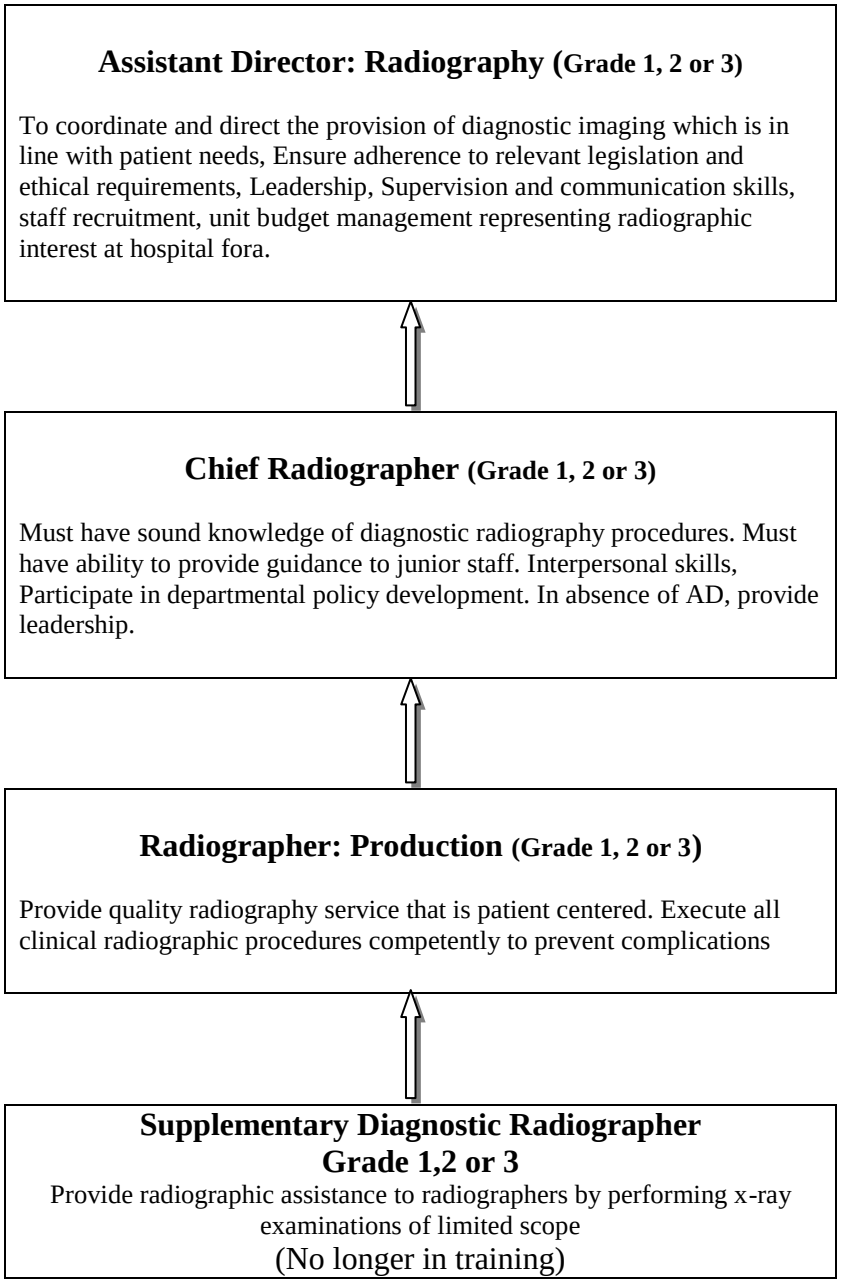


Figure 2.8 South African version of the four-tier model

As a rural radiographic manager, one must recognise and acknowledge that his/her primary duties are to support and at the same time helping the supervisees to improve their own practice competencies. Furthermore, as a manager a radiographer needs to take cognisance that every decision made must ensure equitable delivery of

radiographic services. This is so because in many instances rural radiography is practiced in a context of numerous and significant challenges such as resource constraint. However, Olsen and Neale (2005:1219) express concern that this type of leadership is seldom included as part of clinical training for radiographers.

Besides the traditional imaging duties, radiography managers in rural areas are called upon to attend and solve a variety of problems. Apart from radiographic problems such as accommodation of individual patient needs, rural radiographers' managers are also required to attend to professional relationship, client service and patient care all of which may not have been acquired during training but essential in rural areas.

As mentioned earlier not all rural district hospitals have the post of AD. In these hospitals management responsibilities rests with the chief radiographer. Even though these chief radiographers may play a multi-skilled role in rural hospitals, they are often inadequately prepared for some of these tasks (Eygelaar & Stellenberg 2012). Rural hospitals on the other hand do not have stipulated interventions that may be used to transition these radiographers from a beginner to a competent professional. This, however, is not the case in most developed countries with regard to nursing professionals. Those countries have developed interventions that are aimed at transitioning the new graduate nurse from advanced beginner to competency level (Burns and Poster 2008:67).

2.7.11 Communication and information management

Booth (2007:135) writes that in many instances, communication is seen as a natural process and as such the importance of doing it well is often underestimated. The majority of malpractices involving radiologists in the United States of America, for example, have been associated with inadequate communication (Towbin, Hall, Moskovitze, Johnson & Donnelly 2011:w48). This lack-luster approach is changing in most developing countries such as South Africa due to growing interest in health promotion and disease prevention and hence health communication has been encouraged (Alali & Jinadu 2002:81). Some of the roles that effective health communications between health care workers play, according to these authors, include:

- Guiding effective health care
- Ensuring effective health promotion
- Facilitates effective dissemination of health information

In the context of radiography, diagnostic imaging is an integral part of the rural healthcare system. Any patients who seek health care services at these rural hospitals go through the x-ray department at one point or another during the course of their treatment. An overall effectiveness of a rural diagnostic imaging department depends on the ability of radiographers to provide a quality service to both the referring clinicians and the patients. In order to achieve this, there must be effective communication between radiographers and the clinician and the patients in particular.

Effective communication between a radiographer and a patient is of particular importance. Communication enables the patient to adhere to requests from radiographers which results in cooperation during the x-ray examination. The effect is optimal outcome. This is in line with Tongue, Epps and Forese (2005:652) who argue that patient satisfaction and adherence to health care instructions is linked to better health worker-patient communication.

The quality of information that the patient receives is considered as an important aspect of today's health care (Sheard & Garrud 2006:43). Effective and clear communication between rural radiographers and rural patients with regards to the limitation, cost and risks associated with x-rays is important. Haldeman (2001:307) explains in another context that patients seeking spinal pain treatment encounter difficulties in obtaining consistent information from various health workers as to the relative risks and benefits of treatment options available. Radiographers in rural hospitals have to provide patients with information about x-ray procedures. Yet, a study conducted on factors influencing patients' demand for x-ray examination in rural KZN found that only 10.9% out of 110 sampled patient had good knowledge about x-rays (Mung'omba & Botha 2012:18). These results cast a shadow on the way health professionals and rural radiographers in particular communicate and disseminate information about diagnostic imaging.

The challenges of communication are very noticeable in rural setting because many patients who seek health care services have little or no formal education. Even though rural patients may not be educated enough they are however likely to respond to non-verbal communication such as body language. In such situations, a positive non-verbal communication exhibited by a radiographer is likely to improve radiographer-patient relationship.

Another challenge is that the rural radiographer, in the process of communication, must also take into account factors such as the culture, ethnicity, socio-economic status and spiritual beliefs of a given community (Health and Care Professions Council 2013:9). In the same vein, literature describes rural radiographic practice as a complex of web of social relations that include cultural history and social political network ((Bourke, *et al* 2004:181). A study done in Australia on the perspective of desired attributes for medical graduates practicing in rural communities found that unless medical students were equipped with effective communications skills it is likely that issues of equity will continue (Woolley, Sivamalai, Ross, Duffy & Miller 2013:93). In view of the above, one is bound to suggest that practicing of rural radiography entails different ways of communication and added responsibilities.

2.7.12 Personal characteristics and behaviours of individual radiographers

According to Hoge,Tondora and Marrelli (2005:518) manifestations of human characteristics include values, attitudes, traits and behaviours. These characteristics according to the same authors could influence one's behaviour at work and may be required for effective performance.

2.7.12.1 Maintaining personal and professional boundaries

Personal and professional boundaries are an important aspect of practicing in general and radiography particularly so in rural areas. According to Baca (2011:195) boundaries provides a safety net between health professionals and their patients. The issues of personal and professional boundaries that rural radiographers encounter may not necessarily mirror those of their counterparts in bigger health institutions. This is because radiographers working in rural areas are more involved in

community activities than their counterparts in urban hospitals.

The issue of personal and professional boundaries hinges on one's behaviour in the work environment. However, even though personal and professional boundaries may be an intricate part of rural radiography it is likely that it is not well covered during training. In the same vein Baca (2011:195) expresses concern that discussions about professional boundaries may not be as common as they used to be in the undergraduate programmes for many students.

2.7.12.2 Being accountable

The concept of accountability by health professionals is not new (Fleet, Kirby, Cutler, Dunikowski, Nasmith & Shaughnessy 2008:16). It is therefore important that a rural radiographer becomes fully accountable for decisions made in the line of duty (Colyer 2012:43). This means that rural radiographers must be aware that they are accountable to themselves, the hospitals where they work and above all to the patients for the care and the diagnostic imaging they offer. However, evidence from a study conducted in Australia on radiographers suggests that the tendency by radiographers avoiding accountability may be historical or may be linked to lack of professional confidence and aversion of risk (Colyer 2012:45).

The discussion in the above sections and subsections addressed the concept of competency and also some of the competencies that may be required by rural radiographers as an additional to those obtained during pre-service training.

2.8 COMMITMENT TO CONTINOUS PROFESSIONAL DEVELOPMENT BY RURAL RADIOGRAPHERS

2.8.1 The Health Professionals Council of South Africa (HPCSA)

Authors have described CPD as a post-basic education that is aimed at updating existing knowledge and skills of practitioners and thereby improving the care given to the patients (Tame 2009:6). Thus, in order for rural radiographers to maintain and improve their competencies they must involve themselves in the process of lifelong

learning. Moreover, it is a statutory requirement for all radiographers in South Africa to register with HPCSA in order to practice radiography. The aim of this regulatory body is to protect the public by registering health professionals who meet the required standard of training. In order to maintain the health professional's competency, HPCSA sets out standards for CPD (HPCSA 2010:1).

It is a mandatory requirement for all health professionals, including radiographers, who are on the HPCSA's register to maintain an up-to-date record of CPD activities. The immediate aim for mandatory CPD requirement by professional bodies is to ensure that members on the register are fit to practice (Haywood, Pain, Ryan & Adams 2012:83). It has been argued that CPD should not be mandatory until such a time when there is enough evidence available to support it. In contrast more than half (58%) of radiographers who took part in the study by Sholer *et al* (2011:28) reported that CPD should be mandatory.

2.8.2 Rationale for CPD

WHO report of 2006 also identified lifelong learning as a strategy to improve work performance in middle phase (WHO 2006:1). The HPCSA (2010:1) is of the view that CPD enables all health professionals to maintain and enhance their knowledge and skills thereby improving the quality of health care services. This notion is supported by evidence from literature which suggest that the most important aim of CPD is to enable health professionals provide the best practice for patient care (Stagnitti, Schoo, Reid & Dunbar 2005:355).

The diverse nature of rural radiographic practice requires radiographers to be updated in a number of areas such as management, teamwork, planning, evidence-based practice and leadership. Besides, there is an increasing demand for rural health professionals to be more responsive to the health of local communities they serve. Therefore, in the context of radiographers working in rural areas, CPD may be viewed from a broader context that include personal, social, health system and political aspect of rural healthcare (Fleet, *et al* 2008:15). This broad context of learning needs for rural radiography practice can, according to Rødahl, Thingness and Lewis (2011:9), be explored using CPD and lifelong learning activities as a

catalyst. However, literature eveals that radiography, as a profession, has been stigmatised with the culture of low self–esteem, apathy and resistance to change (Sim & Radloff 2009:203; Yielder & Davis 2009:345).

2.8.3 Awareness of CPD activities

Most of the radiographers working in rural South African hospitals seem not know what CPD entails. The CPD guidelines are viewed by rural radiographers with relatively narrow understanding of what it means. Literature shows that this may not be an exception. For instance, Gawugah *et al* (2011:333) report that some Ghanaian radiographers view CPD engagement as an additional workload. When it comes to rural radiographic practice, it is essential that radiographers understand the role of other health care professional and team work. Given that rural radiographers have such a wider role it is necessary that the contents of their CPD activities are developed and offered differently. It is the view shared by Cooke *et al* (2011: 107) who argue that properly organised and locally based CPD programmes are an essential factor in the retention of rural health care professionals.

It is a primary responsibility of all radiographers including rural radiographers to ensure that they develop and maintain professional competency which is relevant to radiography. In the case of radiographers working in rural areas, maintenance of competency appears to be a challenge. While those radiographers working in urban hospitals may engage in CPD activities such as reading appropriate journals, internet and research without realising, this is not the case with their counterparts in rural hospitals. In any case De Villiers, De Villiers and Kent (2006:18) are of the view that undertaking CPD activities by reading journals and attending seminars is not an appropriate and effective way of obtaining knowledge and skills. Regardless of the methods for delivery of CPD programme, CPD activities may be used to complement competency deficit on the part of rural radiographers.

2.8.4 CPD activities on offer

Many of the CPD activities on offer by the Society of Radiographers of South Africa SORSA) particularly KZN branch appear to target radiographers working in urban

hospitals where advanced technology is becoming a norm. For instance, the SORSA's KZN branch CPD seminar that was held on the 17th May 2014 included topics like ''CT protocols on radiation dose'' on the programme (SORSA KZN Branch 2014). Many of rural radiographers who engage in these CPD activities do so for the sake of meeting legislative requirements. This then makes it difficult for rural radiographers to attain and develop competencies that reflect rural radiographic practice. Henwood and Flinton (2012:182) noted that this offers no assurance of radiographers' actual learning or clinical competency. This is further compounded by the failure of many people and in some instances policy makers to acknowledge that rural health is different and distinctive (Humphrey 1999:61). In other African countries such as Ghana there is even no policy document and guidelines altogether (Gawugah *et al* 2011:334).

Since the rural radiography practice is wider in scope it demands constant updating of skills in various areas. For that reason, informal or formal CPD activities should be directly related to one's working environment. This is echoed by Fleet *et al* (2008: 16) who sees the need for more health workers education at all levels of education continuum namely; undergraduate, postgraduate and CPD. The education of health workers, according to these authors, must meet the health needs of the local community being served.

2.8.5 Barriers to CPD engagement by rural radiographers

In the context of South African rural radiographers, obstacles to CPD engagement may include:

- Frustrations,
- Workload and time constraint
- Attitude

There are more barriers that may hinder radiographers working in rural hospitals from engaging in CPD programmes effectively. Literature reveals that this may include protocol based work environment that focuses on clinical competence, and is likely to affect motivation for lifelong learning (Sim & Radloff 2009:206).

2.8.5.1 Frustrations

Radiographers working in rural KZN hospitals may be frustrated by lack of recognition of their inputs by management of these rural hospitals. This may cause rural radiographers to view lifelong learning as a waste of time. A study conducted by Smith, Cooper, Brown, Hemmings and Greaves (2008:160) in Northern New South Wales showed that 70.6% of the respondents were satisfied with their access to CPD opportunities. On the contrary, other studies have shown that limited access to CPD activities by rural health professionals have been linked to worker frustration (Kean *et al* 2012).

The distance to the venue and the location where CPD activities are offered may also increase frustrations. According to Gawugah *et al* (2011:333) a place where the CPD activities are held may cause loss of interest by most health professionals. Thus, the culture of attending CPD activities among rural radiographers should be encouraged and should remain continuous if they are to reach the required competency levels.

2.8.5.2 Workload and time constraint

Rural radiographers work in an environment which continues to experience an increase in the number of patients referred for radiographic examinations. This problem is further compounded by the shortage of radiographers in rural hospitals. Both workload and to a lesser extent staffing levels were reported by Henwood and Flinton (2012:181) as barriers towards participation in CPD activities by radiographers. Even though there is an increase in the number of performed diagnostic imaging examinations there is no corresponding increase in the number of staff. This type of pressure may affect the radiographers' thought about professional development. Kawooya (2012:4) states that health workers in rural areas are likely to find it more difficult to access continuing education development such as seminars or other academic gathering.

Even though CPD as part of leaning continues to gain recognition worldwide, many rural radiographers face challenges in accessing CPD activities. In many instance, rural hospitals are not adequately staffed. Shortage of staff makes it difficult on the

part of the hospital management to release radiographers to go and attend CPD activities. This increases pressure on the few radiographers working in these hospitals. Consequently, this has a negative ramification on the individual radiographers' attendance of CPD activities.

2.8.5.3 Radiographers' attitude towards CPD

Attitude may be another factor that hold rural radiographers from engaging positively in CPD activities. A study done in the UK on radiographers' attitude towards mandatory CPD found no significant impact on the attitude (Henwood & Flinton 2012:179). Another study conducted on the CPD requirements of radiographers in Europe also indicated that work environment may influence participant's attitude towards CPD (Marshall, Punys & Sykes 2008:334). While the study done in Western Australia on the attitude of radiographers towards CPD revealed that 69% acknowledged that CPD was needed for one to remain competent (Sholer, *et al* 2011:21). In the South African setting, it is possible for radiographers in the hospital or hospitals in the same geographic location to organise and register CPD activities for accreditation. According to Cooper (2002:18), the failure to undertake such opportunities may be linked to lack of imagination, attitude or just lack of foresight to see value in such undertaking.

To change the attitude of rural radiographers towards CPD, there should be a change in the current focus of CPD activities on offer to include activities that reflect the rural practice. Hardy and Snaith (2006:329) for instance suggest that other than formal training, extended competencies such as those required in rural practice can be gained through experiential learning by undertaking locally initiated practical based training, for example local workshops and in-house training. This may help radiographers working in rural hospitals to appreciate the contribution they make towards rural health care. For instance, results of a study done in Greece on nurses' attitude regarding CPD showed beneficial effects on the planning of nursing care (Yfantis, Tiniakou & Yfanti 2010:198). Therefore, it may be necessary for radiographers working in rural South African hospitals to be encouraged to maintain additional core competencies that are needed to provide radiography in rural areas through participation in CPD activities and proper job planning.

2.9 TRAINING OF RADIOGRAPHERS

The assumption that has been made regarding some of the additional competencies discussed under section 2.7 is that many of them may not have been covered during the radiographers' pre-service training. In view of this, the preceding section discusses the radiography curriculum in the context of South Africa.

2.9.1 The concept of curriculum

The word ''curriculum'' has a Latin origin which when loosely translated means the course (Pratt 2005:5). To this effect some authors such as Longstreet and Shane (1993:7) consider curriculum as an historical accident. According to these authors the curriculum has not been developed to meet a clear set of objectives but rather it has evolved as a response to the ever increasing complexity of our modern day education and decision making. This view is in contrast with Goodson (1994:111) who describes curriculum as a multifaceted concept that is constructed, negotiated and renegotiated at various levels and arenas. In the same vein, the South African National Education Policy Investigation Research Group (1992:2) also noted that since curriculum is a social product, it needs the involvement of beneficiaries to identify essential knowledge and basic skills for a given programme. The curriculum may therefore be viewed as a vehicle to achieving specific educational goals and objectives (Su 2012:154).

2.9.1.1 Radiography curriculum in South Africa

The core of radiography curriculum in South Africa is based on the traditional biological, physical and social sciences (Engel-Hills 2005:35a). This observation may not be different from the radiography training curriculum in Hong Kong in which 90% of the radiographers, who took part in White's (2003:206) study, reported that the curriculum was too- content driven. In the context of South African radiographers, the HPCSA as a registering authority needs to satisfy itself that radiographers are safe and competent while in the context of the UK, Price (2006:164) raises a concern that the curricular used in the training of radiographers reflects contemporary practice.

The curriculum must include and describe the exit-level outcome which might include areas such as reflective/critical thinking competencies, practical competencies, clinical competencies *etc.* When combined these outcomes constitute the applied competency of a graduate radiographer at this level. Furthermore, a good radiography curriculum should be able to provide the students with a strong foundation of core knowledge while availing them with skills that will serve them beyond radiography profession. In particular the curriculum must help student radiographers to develop skills such as information literacy, management and leadership, scientific enquiry, critical thinking and self-reflection (Baird 2008:e9). The intention of a well-developed radiography curriculum is therefore to promote best patient care in x-ray departments. For example, Hays and Gupta (2003:17) propose that cultural perspectives of rural communities may be included in case design, curriculum implementation and assessment practices. As indicated in section 2.7 above this may not be the case in the context of the South African radiography curriculum.

Even though the current curriculum exists for the purpose of training radiographers, there appear to be no link with the core competencies required to effectively practice in rural areas. Reid and Cakwe (2011:37) noted that since student's learning is driven by assessment, it is important that knowledge, skills and attitude relevant to rural practicing are included. But these authors acknowledge that there is no formal assessment specific to rural setting at the moment. For instance, language-competency is identified as one of the criterion not used in the final year assessment of medical students and yet communication is central in healthcare services (Reid & Cakwe 2011:37). To this effect, the Council on Higher Education (CHE) in South Africa called for the enhancement of the undergraduate curricula across the disciplines in order to meet both contemporary, local and international conditions (CHE 2013:19).

2.9.1.2 Qualifications of the South African radiographers

To become a diagnostic radiographer in South African one has a choice between two undergraduate programmes that lead to HPCSA registration qualifications, namely a national diploma in radiography and a baccalaureus degree in radiography

(Davidson 2006:9). According to the regulation relating to qualifications of radiographers, a qualification which is obtained after the training that does not exceed a minimum of two years must not be accepted for registration (Health Professions Act 56 of 1974:2). However, in the recent past the education in general and the training of radiographers in particular has undergone numerous changes and among them is the introduction of the Baccalaureus Technologiale (B.Tech.), Master of Technology (M.Tech.) and Doctor of Technology (D.Tech) degrees. Each of these categories has specific subsection with specific competency requirements (Etheredge 2011:12).

Despite the introduction of these qualifications, by far the majority of South African radiographers have only attained a diploma in radiography. Elsewhere, the results of a study done in South West Australia showed that the majority of allied health professionals were well educated with more than half of the respondents having post graduate qualifications (Stagnitti *et al* 2005:359). According to Baired (2008:e9), competency at diploma level is viewed as a linear process that can be assessed objectively. The successful completion of a diploma course in radiography may not constitute competency. This view is shared by Anema and McCoy (2010:2) who suggest that completion of education appear not to prepare these radiographers for workplace. Evidence from the literature reveals that there appear to be a consensus that many healthcare graduates are not adequately prepared to operate in a complex work environment (Anema & McCoy 2010:10). These authors have proposed a competency based education which they argue that the need for this type of education has been recognised for years.

Lovegrove and Long (2012:230) are of the view that currently radiographers are trained in an environment which requires individuals to conform to agreed behavioural norms. This approach, according to Conway, Little and McMillan (2011:152), has failed to acknowledge the extent of change required to enhance collaborative practice by radiographers working in in rural areas. In the same vein, Baird (2008:e9) argue that it is no longer enough for training institutions in the health care profession to simply concentrate on the development of knowledge base of the students. Since rural radiography practice involves a complex web of social relations that include cultural beliefs, cultural history and social political network,

Bourke *et al* (2004:184) concludes that training improvements in rural practice can only be achieved if one understands this complex web's impact on the rural health practitioner.

Lack of competencies to effectively practice radiography in rural setting may no longer be blamed on individual radiographers alone but on the training institutions as well as the system of care (Hoge, *et al* 2005:511). Radiographers are trained in an environment where the dominance of radiologists and medical doctors is emphasized. Sociological literature cite this type of dominance of one occupational group over another as ''subordination'' (Smith 2006:8). In order to mitigate against this limitations, health training institutions in some developed countries have embarked on the development of core competencies for inter-professional health care collaboration (Verma *et al* 2006:110; Smith *et al*. 2009:136).

2.9.1.3 Curriculum changes for training South African radiographers after 1994

The advent of democracy in 1994, brought changes to the health system and radiographers found themselves working in rural hospitals with patients coming from diverse cultural and linguistic background. According to Engel-Hills (2005:2a), these health reforms had direct impact on radiography curriculum.

The dawn of democracy in South Africa in the early nineties did not bring changes to the health system only but was also coupled with educational reforms. This can be seen in the emergency of competency based qualification as a tool to address the relation between education training and work environment (Parker & Walter 2008:70). This approach according to these authors has been highly contested. The opponents of competency based training argued that this approach could become too 'behaviourist' and 'atomistic' (Parker & Walter 2008:72). In other words, these critiques actually feared that the competency based was narrow and was likely to focus on specific skills performance only. Government's response to these critiques of competency based qualification was a deliberate policy declaration in the 1990s which introduced the use of Outcome Based Education (Parker & Walter 2008:72).

The introduction of outcome based qualification framework, which according to

Malan (1997:3) was designed to create lifelong learner through integration of theoretical and practical learning. Among the many aspirations that was embodied by the National Qualification Framework (NQF) was to enable people to become lifelong learners (Parker & Walter 2008:71). Even though the National Qualification NQF requires that standards should be nationally prescribed, the learning contents and process for example is determined by a region or institution (Malan 1997:3). To this effect, literature reveals that all nine South African Universities with health science faculties have a different approach and a unique way in which they train health professionals who choose to work in rural areas (Reid & Cakwe 2011:34).

Despite curriculum reforms some South African researchers have continued to raise concern with regard to the appropriateness of competencies of graduates (Lehman & Makhanya 2005:143). In the case of radiographers, Thulo (2006:104) concluded that there was need for those involved in the radiography training to ensure that radiography programme is aligned to the needs of the communities, policy implementation and learners expectation. Other authors have even suggested that principles of PHC must form the backbone of all health sciences curricula if graduate students are to succeed in rural working environment (Burch & Reid 2011:25). In the context of radiographers, it has been agued by the some authors that the practice of radiography needs to be placed at the center of the curriculum by educators to ensure that the course content is contextualized to the needs of the practice setting (Baird 2008:e9).

In the case of the United States of America (USA), for instance, the Institute of Medicine (IOM) proposed five core competencies that allied health training institution must include in their curriculum (Blagg 2009). The same author notes that the Core competencies identified by IOM for inclusion in the allied health training curriculum are:

- Provision of patient centered care,
- Teamwork
- Evidence based practice,
- Apply quality improvement
- Utilizing informatics.

These are equally important competencies for South African rural radiographers to possess. Some researchers have argued that the South African health training institutions have only focused on two levels of learning namely informative and formative (van Heerden 2013:21). According to the same author, informative learning is where the student learns about facts and skills and becomes a technical expert. Formative learning on the other hand exposes the student to elements such as ethical norms and professional behaviours which produces a professional (van Heerden 2013:21).

Training institutions may argue that they produce adequately trained radiographers. This argument is subject to debate. One is bound to ask the question whether this adequacy in training take into consideration the variations in the work environment. A study by Reid and Cakwe (2011:36) found that health professional's exposure to rural setting varied between 3% and 25% of clinical curriculum time in different health disciplines and universities. This however tend to increase in the final years of the student according to these authors. Nevertheless, Davidson (2006:11) advocates for dual responsibility. She argues that apart from the need for the curriculum to reflect what is expected of a newly qualified radiographer in workplace, the hospitals should also take cognisance of what radiography trainers are attempting to achieve.

The shortage of radiographers in rural areas makes most rural hospitals to rely on newly qualified radiographers who are expected to shoulder many responsibilities. Though, this may appear as a daunting task, Engel-Hills (2005:25b) is of the view that a well-designed curriculum is likely to support these radiographers and enable them to cope. On the other hand, Suter *et al* (2009:42) are of the view that competencies must not be an end point to the training process but rather tools that may be used to assist in the identification of specific areas of practice by radiography students and practitioners alike. And in the context of radiographers working in rural areas one is inclined to assume that competencies will assist to articulate standards of rural radiographic practice in a defined way.

2.9.3 Community service placement

In South Africa, there is a programme for community placement commonly known

as ‘‘community service’’ for health care professionals including radiographers. The first year after their graduation the health professionals are required to serve. The introduction of this programme by the South African department of health was to ensure inequities in access to human resource and thereby improve quality healthcare to all citizens (Cooke *et al* 2011:11; Hatcher, Onah, Kornik, Peacocke & Reid 2014; Reid 2002:136). In additional to ensuring quality and improved healthcare to all citizens, rural placement is also supposed to offer exposure and experience for the new graduates to rural healthcare practice.

2.9.3.1 Preparation of radiographers for community service placement

There is overwhelming evidence in both developed and developing countries that these health care professionals continue to be ill-prepared for rural environment (Smith 2005). This school of thought is supported by Bell, MacCarrick, Parker and Allen (2005:2) who argue that sound preparation for rural service is more than just placement but it’s about knowledge and skills. Moreover, a study on the contribution of South African curricula towards preparation of health professionals for working in rural areas found that non-medical health science students are more involved in rural based learning but the study questioned their preparation for the realities of South African rural context (Reid & Cakwe 2011:36). This, therefore, entails that the preparation of radiographers for rural practice goes beyond just placement for one year community service. The radiography training institutions have an important role in ensuring that their graduates are prepared appropriately and accordingly. This researcher however, still holds the notion that apart from having a well-designed curriculum it is equally important for the new graduates to have access to professional mentorship. This mentorship may assist the graduates to develop context specific core competencies.

2.10 CONCLUSION

There is limited literature about additional core competencies required by radiographers working in rural areas of South Africa and in particular rural KZN. This lack of literature may suggest that South Africa’s study of rural health and in particular rural radiography lags behind developed nations such as Australia.

Although there may be very little literature related to additional core competencies required by rural radiographers locally there is a lot on other allied health professionals working in rural areas. The literature, as provided above on issues related to additional core competencies, further suggest that in order for radiographers working in rural areas to deliver radiographic service that meets the needs of rural communities, it is important to identify context-specific core competencies required to practice efficiently. The literature review further provided some form of guidelines along which this study was focused by also addressing some of the competency areas identified in the RRCF (Figure 1.1).

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCATION

In this chapter the researcher sought to underscore the main components of the Exploratory Sequential study that was undertaken in the rural district hospitals of KZN. The study attempted to identify and investigate additional core competencies required by radiographers working in rural areas of South Africa. Furthermore, this Chapter 3 describes the research methodology that was applied. As a mixed methods research, the study was conducted in two phases and each phase is discussed individually in this chapter. The discussion includes the research design, methods used to collect data, the population, sampling procedures, rigour – trustworthiness, validity and reliability. Presentation of this chapter is based on the integrated model of mixed method thesis where the qualitative phase and quantitative phase are presented in a single method chapter (O'Cathain 2009:140).

3.1.1 Objectives of the study

The objectives of the present study which was conducted using a mixed methods approach were to;

- investigate and identify additional core competencies required by the rural radiographic workforce.
- identify the challenges that rural radiographers face in the execution of their duties
- analyse the curriculum of a training school for radiography in South Africa and compare study results to determine the competencies that may not have been included in the curriculum.
- Propose a CPD strategy based on the results of the study.

In order to reach the above mentioned objectives, this study was done in two phases namely;

- Phase I – the use qualitative approach
- Phase II – the use quantitative approach

3.2 EPISTEMOLOGICAL ASSUMPTIONS

3.2.1 Philosophical assumptions

Creswell and Clark Plano (2011:41) define epistemology as a worldview of how we gain knowledge and about what we know. The philosophical assumption, taken by this researcher, in designing this study was based on multiple worldviews with these worldviews shifting from one strand to another (Creswell & Clark Plano 2011:87). The study on the additional core competencies of radiographers working in rural areas of South Africa is not just about intra and inter professional issues but it encompasses areas of clinical practice, patient care, inter-professional collaborations and rural health care delivery. Therefore, other than the quantitative research, qualitative research may also be applied (Curtis & White 2005:218). This means that the researcher took a pragmatism stance which considers a multiple viewpoints of a research problem (Andrew & Halcomb 2009: xvi), which in this case is more than just additional core competencies of radiographers working in rural areas of South Africa. According to Creswell (2003:11), the focus of the research problem is influenced by a philosophical foundation

Moreover, Christ (2013:110) notes that the emergence of mixed methods is viewed as an alternative to the two traditional opposing epistemological sides namely qualitative (subjectivism) and quantitative (objectivism). Therefore, in order to evaluate and understand this phenomenon under study both subjective and objective data were needed. It was assumed that combining subjective (qualitative) and objective (quantitative) approaches would yield the best possible evidence regarding the additional core competencies required by radiographers working in rural areas of South Africa and consequently help in proposing a CPD strategy for this group of radiographers. Thus the epistemological assumption taken by this researcher rests on the understanding that no one paradigm can allow one to reach the truth but rather a

combination of paradigms will be most useful to understand the problem (Maresh 2009:50).

3.2.2 Mixed methods research

Literature suggests that there is an on-going debate on the terminology with various authors putting forward different terms. But due to the common usage there appear to be a consensus around the term ‘‘mixed methods research’’ (Denzin & Lincoln 2011:285). Tashakkori and Teddie (1998:17) define mixed methods research as a type of research in which qualitative and quantitative approaches have been combined in a single or multi-phase study methodology. Other researchers have defined mixed methods research as a combination of methods, philosophy and research design orientation (Creswell & Plano Clark 2011:5). Writing the preface for the SAGE Handbook of mixed methods in social behavioral research, Tashakkori and Teddie (2003:x) noted that the methodological orientation of mixed methods research has now evolved to a level where it has its own worldview, technique and vocabulary.

Other researchers have further argued that mixed methods research has since emerged as a third methodological or research paradigm thriving and coexisting with traditional paradigms namely quantitative and qualitative (Johnson, Onwuegbuzie & Turner 2007:177). On the contrary, Morse and Niehaus (2009:11) have raised concern about the on-going uncertainty about rules for rigour in mixed methods research. Despite the ongoing debate on pros and cons however, Collins & O’Cathain (2009:2) are still of the view that mixed methods research has emerged as a research paradigm in recent years.

The above argument is supported by evidence from published literature which reveals that mixed methods as a research paradigm has become a widely used mode of inquiry (Terrel 2011: 255). Some authors have even suggested that mixed methods research, as a research tool, can help healthcare professionals meet some of the current health challenges (Halcomb, Andrew & Brannen 2009:6). This notion is supported by published literature as evidence attest to the ever increasing use of

mixed methods approach in several health related studies (Creswell, Klassen, Plano Clark & Smith 2012:2).

3.3 RESEARCH DESIGN

Research design is defined as a plan that is followed to answer the research question and specifying control mechanisms in some cases (Babbie & Mouton 2003:647; Brink and Wood 2001:99). Other authors describe research design as a blueprint for a study (Burns & Grove 2005:211). Traditionally there are two research paradigms namely, positivism and constructivism. A fervent debate about quantitative and qualitative research paradigm has been going on for the last 100 years (Onweugbuzie & Leech 2005:375). According to the same authors the opposing sides namely the positivists as proponents of quantitative approach and constructivist as proponents of qualitative approach tend to focus on the differences between the philosophies instead of the similarities.

Quantitative research paradigm, according to Burns and Grove (2005:23), uses numerical data to obtain information about the phenomenon in a formal, objective and systematic process. Some of the main research designs according to the quantitative paradigm include experimental designs such as random clinical trials, quasi-experimental designs and non-experimental designs such as descriptive and correlational studies.

On the other hand, Polit and Beck (2008:15) describe the qualitative research paradigm as one which consists of multiple realities that includes subjectivity, individuality and also the contents where the research is conducted. The qualitative paradigm research designs may include phenomenology, grounded theory and ethnography (Curtise & White 2005:218).

For a long time this debate about research paradigm has made researchers to seem to have a dichotomous choice between quantitative and qualitative research approaches (Leech & Onwuegbuzie 2009:265). Yet, these authors argue that there is a third viable choice namely mixed methods research approach. Even though there is still debate over the term ‘‘Mixed Methods Research’’ Denzin and Lincoln (2011:285)

confirm that due to common usage there appear to be a consensus around the term. In the context of this study the researcher used the mixed methods research approach where quantitative and qualitative are combined. There are various research designs within mixed methods research.

3.3.1 Mixed methods research design

In the literature it is indicated that there are some authors that distinguish among four distinct mixed method research designs namely convergent parallel, embedded, explanatory and exploratory or sequential (Cameron 2009:144; Creswell & Plano 2011:69). However, Morse and Niehaus (2009:11) do not agree with this nomenclature. These authors argue that it may be immature at this stage since there is still debate for mixed method terminology. Despite the different names given to the mixed methods research designs, Bergman (2008:67) identifies only two characteristics which appear to be common to many of these classifications. According to this author, it all depends on the reason for the design which may be either to merge qualitative and quantitative data (parallel or concurrent) or where data from one phase is used on to build on the other data (sequential). For the purpose of this study an exploratory sequential design was used and it will be elaborated below. This researcher chose to use exploratory sequential terminology as it has been used by a number of authors (Creswell & Plano 2011:85; Collins, Onwuegbuzie & Jiao 2006:8; Halcombo & Andrew 2009: 1558). The term ‘‘exploratory sequential’’ will be used throughout the study.

The researcher understands that both qualitative and quantitative research approaches have inherent strengths and weaknesses. To better understand the phenomenon under study, the researcher opted to utilise the strength of both qualitative and quantitative research approaches while at the same time minimizing the limitation aspect of each approach (da Costa & Remedios 2014: 162). This view is shared by Creswell and Garret (2008:322) who explain that mixed method is likely to reduce the weaknesses that may result from conducting a quantitative or qualitative research alone. Thus, by deciding to use mixed method, the researcher seeks to compensate the weakness of one method with the strength of another (Ihantola and Kihn (2011:42). In the context of this study, for instance, the inclusion of a qualitative phase may mitigate for the

weaknesses of quantitative (survey study) which tends to be superficial because of the failure of questionnaires to probe into such complexities as human behaviour and feelings (Polit & Beck 2008:234).

Another rationale behind the use of the mixed methods approach for this study was an attempt by the researcher to provide a more complete understanding of the phenomenon understudy which either qualitative or quantitative research design alone may not provide. Other than providing an expanded understanding of the additional core competencies of radiographers working in rural areas of South Africa this researcher was also of the view that mixed a method research design will increase acceptability of the results when they are generalised to the study context.

Literature suggests that mixed methods research has the potential to provide more insights into the study's problem/research question than one would get from using a single approach either quantitative or qualitative. Cronholm and Hjalmarsson (2011:87) suggest that in a situation where there is a lack of pre-knowledge of a phenomenon to be studied, a researcher should start with a qualitative approach. The researcher opted for this type of mixed methods approach because very little was known about the phenomenon namely; additional core competencies of radiographer working in rural areas of South Africa.

3.3.2 Exploratory sequential design

According to Beldhams-Collins (2011:9) the research problem and the researchers' desired outcome determines the study design. To pursue the problem under study, the researcher employed a mixed methods research using exploratory sequential design. In mixed methods research, the researcher uses stages or phases which according to Leech and Onwuegbuzie (2009:267) can be conducted concurrently or sequentially. Exploratory is a two-phased sequential design in which the researcher begins by exploring the problem in Phase I before building on to the next phase (Creswell & Clark Plano 2011:87; Cameron 2009:144).

The researcher used the exploratory sequential study design with the intention to first explore the phenomenon of investigating and determining the core competencies

required by radiographers working in rural areas of KZN. The researcher chose this method for this study in an attempt to present a full picture regarding additional core competencies required by radiographers working in rural areas of KZN. This study was conducted in two phases with the first phase dealing with the collection of qualitative data while the second phase dealt with the collection of quantitative data.

In the exploratory sequential design the analysis of qualitative data in Phase I was carried out first, and this led to the development of instruments for collection of quantitative data in Phase II. This is also the view of Mertens (2010:297) and Onwuegbuzie and Johnson (2006:53) who writes that in sequential type of mixed methods research, one type of data provides a basis for the collection of another type of data. In the context of this study, Phase I of the study was connected to Phase II by using the results from the qualitative data analysis for the development of the data collection instrument for quantitative phase.

3.3.2.1 Advantages of exploratory sequential design

A number of advantages associated with exploratory sequential design were identified some of which are listed below:

- Exploratory sequential mixed method design is a relatively straight forward methodology and easy to implement (Creswell & Plano Clark 2011:89). This may be due to its clear and distinct phases. In terms of this study, for example, recruitment of participants for both phases was easy and straight forward as they were drawn from the same population.
- The quantitative strand of the research may make the qualitative strand more palatable to those audiences who have a bias towards quantitative research. Simply put, mixed methods research may provide, according to da Costa and Remedios (2014:162), more confidence in the results of the research. The inclusion of statistical analysis in Phase II of this study may appeal to those with a bias towards quantitative.
- As a mixed methods study, it might lead to a complete understanding of the issue (problem) since it affords diversity, versatility and creativity in the way the researcher approaches the problem (Andrew & Halcomb 2011:14).

- It may provide the researcher with an opportunity to produce a product such as data collection instrument as a result of the research process (Creswell & Clark Plano 2011:89). The study provided this researcher an opportunity to develop an instrument for Phase II.
- As a mixed methods study it may provide the researcher with an opportunity to develop a wide range of research skills (Halcomb & Andrew 2009:15). This research design afforded this researcher, with only quantitative background knowledge, an opportunity to learn more about qualitative research process.

3.3.2.2 Disadvantages of exploratory sequential design

Despite several advantages associated with exploratory sequential design it is not without disadvantages. Some of the disadvantages include:

- The two-phased nature of exploratory sequential design may take a long time to implement because of two-phased data collection and analysis (Bryman 2007:14). In order to mitigate for this challenge, the researcher took into account the time factor during the development of the research proposal.
- It may be difficult when it comes to making a decision on which results from the qualitative analysis to use in the development of data collection instrument for Phase II. To circumvent this challenge the researcher applied Bergman's (2008:78) suggestion which states that the researcher may, after analyzing qualitative data identify main quotes, form codes which are then grouped in themes and categories.
- The exploratory sequential design may require the researcher to have knowledge and skills of various research methods (Terrell 2011:275). The researcher sought the assistance and help from researchers who are well vested in the qualitative research because the researcher's previous research experience was in the quantitative process.
- Mixed methods research may be more expensive in terms of monetary and time since it involves combining qualitative and quantitative approaches. According to Abowitz and Toole (2010:108) this may be a small price to pay as compared to the improved validity and reliability of the findings that

emanate from mixed methods research.

Despite the above challenges, it was the view of this researcher that if the exploratory sequential design was carefully planned and executed, it would be able to provide a unique insight and potential to widen the current knowledge of the core competencies required by radiographers working in rural areas of South Africa and consequently the proposal of a CPD strategy.

3.4 PROCEDURES FOLLOWED AND DEVELOPMENT OF THE INSTRUMENTS

According to Tashakkori and Teddie (2010:5) methodology in mixed methods research involves a broad inquiry that guides the selection of a particular method which is informed by common conceptual positions. As stated earlier, the motivation behind the choice of mixed method research approach in the context of this study was based on the researcher's assumption that viewing the topic under study from multiple perspectives will enhance and enrich the meaning of a mono perspective (Creswell, *et al* 2012:6). The procedures followed in this exploratory design and instrument development are presented in diagram 3.1 below. This is in line with Creswell and Clark Plano (2011:190) who recommend that it may be necessary to draw a diagram that illustrates the various steps needed to develop a good instrument.

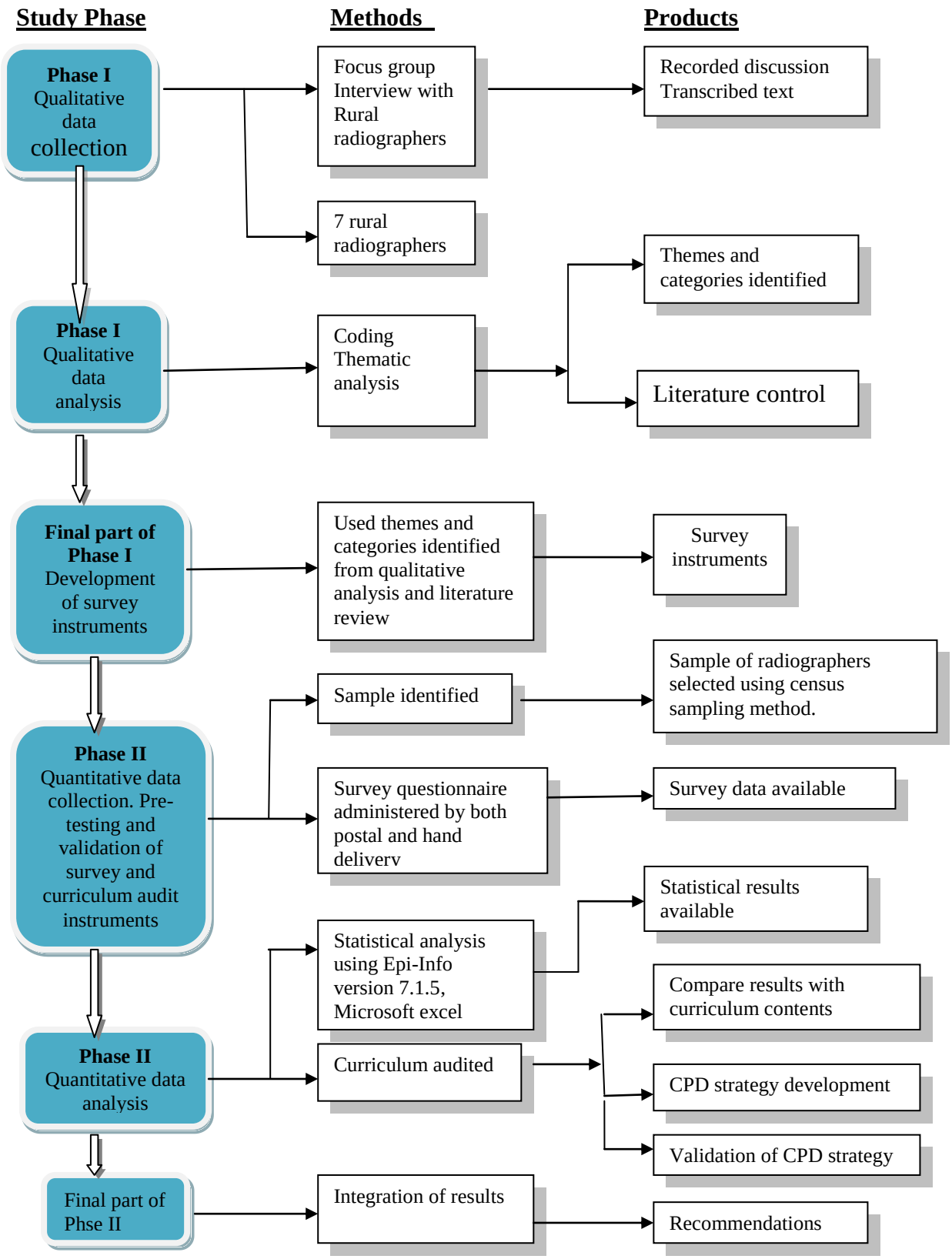


Figure 3.1 Diagrammatic representation of the procedures followed in this exploratory sequential research methodology

3.4.1 Study population and sample selection

Study population according to Burns and Grove (2005:342) is described as the entire set of individuals having some common characteristics. While Kasunic (2005:17) writes that study population refers to all members of a specific group. It is essential to define clearly the target population about which the researcher wants to collect information (Joubert & Katzenellenbogen 2007:94). The target population in this study was all radiographers working in rural hospitals of the KZN province of South Africa. This province was chosen because according to the Department of Treasury (2011:193) report it is a province with a concentration of rural municipalities. Furthermore, KZN was selected based on factors such as cost and accessibility and also because the researcher is employed in this province and therefore familiar with the environment.

3.4.2 Sampling in exploratory sequential design

The multiple data collection that characterises mixed methods research demands dual sampling. Therefore, since the study was conducted in two phases, there were two samples; namely the focus group in Phase I and survey samples for Phase II. In mixed methods research, sampling methods must be decided for both qualitative and quantitative phases of the research (Collins, Onwuegbuzie & Jiao 2006:85). Before deciding on what type of sampling method to be used for each phase, the researcher took into account the objectives for the study phase as well as time orientation of the study. Time orientation in mixed methods research, according to Leech and Onwuegbuzi (2009:268) refers to whether the first phase and second phase of the study occur at the same time (concurrent) or whether they are done one after the other (sequential).

Furthermore, Collins and O'Cathain (2009:5) are of the view that it is important for any researcher undertaking mixed methods study to identify the relationship of the study participants in the first phase and those in the second phase. In this regard, Onwuegbuzie and Collins (2007:292) identify four relationships of quantitative and qualitative samples in mixed methods research namely identical, parallel, nested and multilevel. This study used a parallel sample relationship. This entails that the

samples for focus group interview and survey were different, in terms of participation in the study phases, but drawn from the same population of interest (rural radiographers). Those participants who took part in the first phase were not included in the second phase.

3.4.3 Sample size in exploratory sequential design

Just like in the quantitative or qualitative research, researchers using mixed method approach should also determine sample size for each phase. According to Ongwuegbuzie and Collins (2007:287) the choice of the sample size in mixed method research is as important as a sampling scheme. This however should be informed by study objectives. A number of factors may influence sample size determination. For instance, Onwuegbuzie and Collins (2007:288) argue that determination of sample size should be informed primarily by study objectives and research design. On the other hand practical constraints such as time, cost and the diverse nature of the population may have a bearing on the determination of sample size for survey (Terre Blanche, Durrheim & Painter 2006:49).

3.4.4 Inclusion and exclusion criteria of participants

Inclusion and exclusion criteria were set for probable participants in the study. According to Stommels and Wills (2004:305), inclusion and exclusion criteria are a way of defining who is eligible to become a respondent and who is not. The inclusion and exclusion criteria will be dealt separately under each phase of the study.

3.4.5 Data collection in exploratory sequential design

As mentioned earlier, it was the view of this researcher that neither qualitative nor quantitative data alone were enough to capture all aspects related to this topic. This made the researcher to use the concept of mixed method research as it provides for the collection of both qualitative (text) and quantitative (numerical) data (Brannen & Halcomb 2009:69). The combination of methods was thus aimed at providing an expanded understanding of the scope of the additional core competencies of rural

radiographers and to further increase the confidence of the results when they are generalised to the wider rural radiography population. Some researchers have argued that if both numerical and text data is collected sequentially or concurrently it can help to better understand the research problem (Ivankova 2002:44). Moreover, multiple data collection enhances the validity of the results and might overcome any bias that may result from using a single approach.

A mixed methods researcher has to make a choice from the two techniques (mixing) of data collection namely; intra-method mixing in which one method is used for both qualitative and quantitative and inter-method mixing where two or more methods are used (Collins & O'Cathain 2009:6). For the purpose of this study inter-method mixing technique was followed. This means that a focus group was used in Phase I as data collection method while structured questionnaire was used in Phase II. Besides, evidence from published literature shows that focus group interviews and quantitative surveys are the most common methods of data collection (Brannen & Halcomb 2009:70).

According to Merttens (2005:292) there are two forms of data collection in mixed methods research namely parallel and sequential (Figure 2). Small (2011:63) also notes that there are two or more data collection techniques applied in most mixed methods research. In the context this study, the researcher in consultation with the supervisor and the statistician developed both instruments for collection of data from focus group and survey and an audit instrument for the analysis of the curriculum.

In order to maintain rigour in data collection, the researcher followed the recommendations by Creswell and Clark Plano (2011:172) which require the advancement of persuasive and rigorous data collection procedures in the qualitative and quantitative strands respectively. This will be elaborated further where each phase is discussed.

3.4.6 Validity of exploratory sequential design

Literature search reveals that despite the cost in terms of money, time and energy, mixed method research enhances the validity and reliability of the resulting data and

consequently strengthening inferences (Abowitz & Toole 2010:108). However, despite this assertion, Giddings and Grant (2009:119) are of the view that both strands namely qualitative and quantitative require explicit criteria by which they can be validated in order to ensure quality of a given mixed methods study.

In mixed methods research, strategies that are implemented to mitigate for threats that might compromise the conclusion drawn from merging or connecting qualitative and quantitative phases are defined as validity in mixed methods (Creswell & Clark Plano 2011:239). These potential threats, according to these authors, might come from areas in the research process such as data collection, data analysis and interpretations. For instance one of the threats to data collection in the exploratory sequential design may come from the methods used to select participants for the qualitative and quantitative phases from different population (Creswell & Clark Plano 2011:240). To minimise this threat in the context of this study, the researcher used a parallel sampling method which, as indicate earlier, entails that the sample for both strands were different but drawn from the same population.

When it comes to validity enhancement in mixed method research, Curry, Nembhard and Bradley (2009:1445) suggest that there was need for the recognition of complementary roles of each method namely qualitative and quantitative. Terrel (2011:274) also agrees with the notion that the same established validity rules in standard qualitative and quantitative research must be followed when methods are combined. This is because the assessment of the quality of mixed methods research is based on the extent to which the researcher adhered to the required criteria that define the quality of each portion of the study namely qualitative and quantitative (Merten 2010:304).

A study on threats to validity and reliability in mixed methods accounting revealed that the important findings in a well conducted research appear to be laid by the traditional validity and reliability of quantitative and qualitative research (Ihantola & Kihn 2011:18). According to these authors, this is because mixed methods research impacts all the elements in the study design namely data collection, data analysis and interpretation.

The validity of this study design was therefore considered according to each phase namely qualitative method in Phase I and quantitative method in Phase II. It means that the researcher considered separately the trustworthiness and transferability of the results of the qualitative phase (see subsection 3.5.1.6). While external and internal validity and generalisability was considered with regard to quantitative phase (see subsection 3.5.5). This view is supported by many authors on mixed methods research who argue for the use of known procedures for each approach namely qualitative and quantitative (Creswell 2009:209; Dellinger & Leech 2007:314; Onwuegbuzie & Jonson 2006:56).

3.4.7 Approach to data analysis in exploratory sequential design

In mixed-methods research, analysis of data involves the use of both quantitative and qualitative analytical techniques within the same framework (Creswell & Clark Plano 2011:203; Onweugbuzie & Combs 2011:3). The analysis may be implemented either concurrently or sequentially. In this study sequential data analysis was used. This means that the analysis involved two phases since data occurred sequentially in two phases in which the qualitative phase preceded the quantitative phase and the results from the initial phase analysis were used to inform data collection instrument in the subsequent phase (Onweugbuzie & Combs 2011:3).

In this study the researcher gave equal importance for both qualitative and quantitative phases of the study, though greater emphasis was placed on the Phase II analysis. According to Onwuegbuzie and Combs (2011:6) placing emphasis on quantitative phase yields quantitative dominant mixed method data analysis. However, the rationale for combining qualitative and quantitative data analysis was, in the case of this study, complimentary. This means that both phases were given equal weight. Furthermore, assigning equal importance to both phases was based on rationale that both sets of data were integrated to guide in the proposal of the CPD strategy.

3.5 RESEARCH METHODS FOR DIFFERENT PHASES

The following sections below outline in detail the research methods followed in the

individual phases. The strength and weaknesses of each method are also discussed within the context of each phase.

3.5.1 Phase I: Qualitative approach

The philosophy of qualitative approach pride itself on how behaviours and social process are determined which may entail using an interpretive or some call it subjective approach (Skinner 2007:319). The focus of this approach, according to the same author, is on how participants experience and understand the phenomenon under study. In this case additional core competencies required by radiographers working in rural areas of South Africa are investigated in order to provide bases for the point of departure for the proposal of a CPD strategy. As suggested by Onwuegbuzie and Johnson (2006:49), the focus of the researcher in this phase was to attempt to capture authentically the experiences of rural radiographers with regard to additional core competencies required to practice radiography in rural areas of South Africa. This is in line with Carcary (2009:15) who argue that the main area of focus in qualitative research is generally the representation of study events appropriately. Moreover, this is the bases of the philosophical and epistemological perspective of the qualitative interviews which allows the researcher to access the participants' understanding of their world and their experiences on a topic under study (Holloway 2005:40).

Furthermore, Skinner (2007:319) writes that qualitative approach has many uses one of which is aimed at exploring the topic in the early phase of the study before embarking on a survey. This view is echoed by Bergman (2011:274) who explains that exploratory phase may be used to explore the dimensionality of the topic under study after which the identified dimensions are included in the survey questions. The rationale for the researcher to consider the using the qualitative approach in Phase I was due to limited or no previous empirical research on the phenomenon under study.

One of the major disadvantages of the qualitative approach is the narrative nature in the analysis and reporting of results which may discourage quantitative biased researchers because the findings cannot be generalized. This shortcoming is however

addressed by combining qualitative and quantitative approaches in a single study as indicated in the introductory sections of this chapter.

3.5.2. Phase I: Focus group

A focus group, according to Holloway (2005:56), is any group that is constituted or organised with the purpose of discussing or exploring a topic or set of issues. Literature search reveals that the number for a focus group may vary from 6 – 15 members (Babbie 2007:322; Bowling 2009: 409). The number of focus group participants must be small enough to allow all participants share insights but it must also be big enough to ensure diversity of opinions. This is in line with Denzin and Loncoln (2011:545) who write that the size of the focus group varies; it can either be small or large.

The focus or interviewing group is, according to Babbie (2007:308), a qualitative method. In this study, the method involved the collection of data from a focus group through interviews with a group of radiographers working in rural hospitals. Burns and Grove (2005:396) refer to interviews as a structured or unstructured verbal communication process between the researcher and respondents during which information is obtained for a given study. In a focus group setting the interview is not done individually, but with the group. However, Brannen and Halcomb (2009:72) warn that for a focus group interview to be successful it requires a facilitator who is skilled. According to Holloway (2005:59) the focus group can be used at the outset of the research to help develop a questionnaire. The focus group interview allowed the researcher to gain insight into the information that may not have been available in the published literature and also provided leads to related key issues for consideration in the development of data collection instrument for Phase II. Evans *et al* (2011:282) suggest that in the case where exploratory study is conducted in an area where there is little information emphasis must be placed on the collection of extensive and rich qualitative data. In the context of this study, it was achieved through in depth interviews with the focus group participants. According to Skinner (2007:319) in depth interviews as a data collection method, are mainly used when detailed information is required from individuals. This is echoed by Golafshani (2003:600) who noted that interviews and observations as a means of data collection

are dominant where one seeks to understand the phenomenon using a naturalist approach. This may entail conducting data collection from participants in their natural settings. In the context of this study, participants of the focus group were invited to a hotel set in the northern part of KZN province. The researcher chose to conduct interviews at this hotel because it was centrally placed, easily accessible and it was familiar to all participants.

3.5.2.1 Advantages of focus group interviews

Some of the advantages associated with focus group interview include:

- Efficient technique for qualitative data collection because the amount of data is increased since it is collected at the same time (Williams, White, Klem, Wilson & Bartholomew 2006:216)
- Flexibility, low cost, results obtained speedily
- One is likely to yield different information from individual interviews during group discussion (Brannen & Halcomb 2009:69).

3.5.2.2 Disadvantages of focus group interview

- Less control by researcher. The researcher used an experienced facilitator to assist during interviews.
- Data may be difficult to analyse. To mitigate for this shortcoming, the researcher solicited the help of a person who has an experience in qualitative data analysis.
- Interviewer needs special skills. The researcher who had no prior experience in the dynamics of the focus group interview used the services of a skilled independent facilitator.
- May be difficult to assemble the group. This was the case in the context of this study. To overcome this challenge the researcher solicited the support of the district office. A letter was issued to this effect and the researcher used it to request medical mangers in-charge of radiographers to release them on the date of interviews.
- There is a likelihood that one individual participant might dominate others

and take over the discussion (Brannen & Halcomb 2009:69). A skilled independent facilitator moderated the interviews

- Members may be prevented from saying what they think and believe about the topic due to peer pressure within the group (Skinner 2007:321). To minimise this challenge, the participants were requested to feel free and express their opinions or beliefs. Participants were also requested to respect each other's views and not to prevent anyone from expressing such views during the discussion.

3.5.3 Phase I: Sampling method for focus group participants

A non-probability sampling method, called purposive sampling, was used to select respondents to be included in the focus group. Literature search reveals that emphasis has been placed on purposeful sampling method in qualitative methods (Skinner 2007:323). Purposive sampling is used to select individuals with particular characteristics and who can provide necessary information (Creswell & Clark Plano 2011:173; Bowling 2009:409). Furthermore, the purposive sampling method was used with the intention of selecting respondents with a mixture of radiographic experience in rural hospitals and also representing gender, age, work experience and geographic locations.

The number of focus group participants must be small enough to allow all participants share insights but it must also be big enough to ensure diversity of opinions. For the purpose of this study, seven participants were selected to participate in the group. This number was considered to be adequate to reflect the views of the study population and hence provide adequate information to enable the researcher to develop survey questions for Phase II of the study.

The focus group consisted of radiographers working in rural hospitals surrounding the hospital where the researcher is working. This is in line with De Vos (2005:202) who argues that the researcher's judgment is a prominent factor in purposive sampling. Besides, the researcher aimed at selecting a homogenous group so as to capitalize on the participant's shared experiences. Holloway (2005:61) warns researchers using focus group to take note of the hierarchy within the group as this

may have impact on data. To encourage participation of radiographers selected for focus group, invitations were personalised by way of addressing letters in each participant's name.

3.5.3.1 Inclusion and exclusion Criteria

The eligibility criteria for the selection of research participants in Phase I included the following:

- Radiographers working in the rural hospitals within the district where the researcher is working.
- Radiographers should be senior and should have not less than four years of work experience in rural hospitals.

The exclusion criteria included the following:

- Supplementary radiographers were excluded even if they met the inclusion criteria

3.5.4 Phase I: The process of data collection

The following subsections outline the procedures undertaken in collecting qualitative data for the first phase of the study.

3.5.4.1 Invitations of focus group participants

Seven participants who met the inclusion creteria were personally contacted telephonically requesting them to participate in the focus group interviews. The researcher then sent personal invitation letters through their respective medical managers. This was done so that participants can be released on the day of interviews. A follow up telephone call was made to each participant two days before the interview reminding them about the date, time and venue and also to confirm their availability.

3.5.4.2 Location for interview

According to Gagnon, Jacob and McCabe (2015:207) location where the interviews

are held may influence the participants' perception and willingness to take part in the study. For this study, the interviews took place at a hotel which was considered as central and neutral. The room and the sitting arrangements were organised by the hotel according to the specification supplied by the researcher and the facilitator. It was requested that the room should be secluded with no disturbances. Polit and Beck (2008:400) are of the view that a successful focus group interview requires an environment that is quite and relaxing. To foster a relaxed atmosphere, participants were served with soft drinks on arrival. This according to de Swardt (2012:35), allow participants to mingle and interact with each other.

The sitting arrangement was such that chairs were set in a rectangular form with a small space in between. The researcher arrived earlier than the participants to check that everything needed was in order, for instance voice recorder and sitting arrangements.

3.5.4.3 Interview process

The facilitator welcomed the participants and ensured that they were comfortably seated. In her opening remarks, she welcomed the participants and extended her thanks and appreciation for each participant's willingness to participate. The facilitator requested all participants to either switch off their cell phone or put them on the silent mode. Then the facilitator requested all members to introduce themselves. Thereafter, participants were given an overview of the topic's objectives, told what is required of them, that is in terms of content, process and amount of time required (Mertens 2010:242; Skinner 2007:321; Terre Blanche *et al* 2006: 304). Then a request to tape record the interviews was made and all participants gave verbal permission. The interview was both tape recorded and by note-taking. The rationale for recording the interview was an attempt by the researcher to maintain the accuracy of the participants' verbal account. The interview was conducted in English language.

During the interview, the facilitator used probing follow-up questions. This was done in order to capture the exact opinions and descriptions of additional core competencies by radiographers and also to ensure spontaneity by respondents. These

probing questions were based on the responses from participants. The facilitator tried at all time to put answers in perspective.

The process of engaging radiographers as study participants in a group discussion enabled them to articulate their own thoughts and views about the additional core competencies for rural radiographers through interviews. Through these interviews/discussions, the researcher was able to explore the experiences, perceptions, and attitudes of rural radiographers of not just about additional core competencies but also CPD activities with regard to rural radiography.

Literature search reveals that there is no prescribed time-limit for the focus group interview but some authors have suggested that the interview should not be longer than two hours (Descombe 2007:181). In the context of this study the interview lasted for 1hour and 45minutes.

3.5.5 Qualitative data analysis

The analysis of qualitative data was based on the steps proposed by Creswell (2003:191) such as identifying themes. This implies that analysis of data in Phase I was based on thematic approach. Giddings and Grant (2009:126) propose that if qualitative analysis in a mixed methods research involves thematic content analysis a researcher may apply validation methods of trustworthiness. During data analysis the researcher also adopted Corbin and Strauss's (2008:67) proposal which requires the researcher to keep away from those personal experiences, as a rural radiographer in this context, which may have influence on the ability to discern new possibilities in the data. Another strategy that the researcher used during data analysis was to ask questions. Corbin and Strauss (2008:70) are of the view that asking questions during data analysis allows the researcher to better understand the problem from the participant's perspective. The summary of the resultant themes was circulated to the participants for validation. This was done to allow them to identify any missing themes. This is because the main objective of rigour in qualitative data analysis is the representation of the participant's view as accurate as possible (Steubert, Speziale & Carpenter 2007:49).

For the purpose of data analysis and maintaining anonymity, participants were assigned fictitious names other than their real names. Thus, the names that appear in the transcribed data are not the real names of focus group participants.

3.5.5.1 Qualitative data coding

During the data coding process the researcher in interacting with data made use of strategies that helped to make sense out of the available data (Corbin & Straus 2008:66). Using transcripts of focus group interview each record was coded. The first coding sorted responses according to objectives. The next data was coded broadly to account for participant awareness and knowledge about core competencies organised according to possible required competencies for rural radiographers. This was then followed by coding of themes.

3.5.6 Phase 1: Trustworthiness

According to Lincoln and Guba (1985:290) trustworthiness is described as how well the researcher is able to convince the reader that the study results are correct and worth taking into account. The trustworthiness and rigour of the qualitative phase of this study was anchored in Lincoln and Guba's (1985:290) method of the trustworthiness, the criteria of which is presented in Table 3.1 below.

TABLE 3.1 METHODS FOLLOWED TO ENSURE TRUSTWOTHINESS

STRATEGY	CRITERIA	TECHNIQUE
Credibility	Member checking: Way of checking researcher's interpretation against those of the participants (Giddings & Grant 2009:127) Peer audit Field notes Researcher's authority	• Interpretation/results were given to the participants for correctness and their reaction was obtained • Participants were given opportunity to refuse. This ensured that those who took part were genuinely willing to give information (Shenton 2004:66) • Holding debriefing with the study supervisor • Tape recording and note taking • Researcher has 13 years of experience in rural radiography
Dependability	Maintenance of audit trail Description of exact steps taken in data collection, analysis and interpretation (Lincoln & Guba 1985:315) Review of research methodology	• Full description of full process as indicated in sections 3.5.4 – 3.5.5 of this study • Trail and the whole study was open to external check and control by the study supervisor • The researcher together with the supervisor requested the comments of qualitative research experts on the methodology
Confirmability	Co-coder	• Holding consensus meeting with the study supervisor verify themes after data coding
Transferability	Purposeful sampling Mixed methods	• Participants were purposefully selected to ensure that they provide rich and true opinion on the topic • Integration of results from Phase I with Phase II results

3.5.6.1 Credibility

The focus of credibility in qualitative research is an attempt by the researcher to try and capture authentically the experience of the study participants and be able to

present the text convincingly (Ihantola & Kihn 2011:6). In an attempt to ensure credibility, individuals approached to participate in the focus group interview were given opportunities to refuse participation (Shenton 2004:66). It is the view of the same author that this way will ensure that those involved are genuinely willing to offer information freely. Moreover, the radiographers in the focus group have been working rural areas and therefore were able to contribute meaningfully to the study.

Furthermore, the researcher held debriefing meetings with the supervisor in the quest to increase credibility. Other methods such as member checks as suggested by Shenton (2004:68) were used. Member checking, according to Giddings and Grant (2009:127), is a way of checking the interpretation made by the researcher against those of the participants. The researcher also used audio recording and note-taking.

3.5.6.2 Dependability

Dependability is a criterion in qualitative research which is equivalent to reliability criterion in quantitative research (Sinkovics, Penz & Ghauri 2008:699). According to Polit and Beck (2008:539) dependability is described as the stability of data overtime and conditions. To achieve dependability of the data, the researcher needs to describe exact methods of data collection, data analysis and data interpretation (Lincoln & Guba 1985:315). The researcher maintained an audit trail and the study was subjected to external control by the supervisor. As suggested by Polit and Beck (2008:335), the researcher requested experts in qualitative research to review the methodology and the results of Phase I of the study. The independent transcriber was enlisted to transcribe all audiotaped focus group interviews and the researcher validated transcripts. Furthermore, Lincoln and Guba (1985:316) proposes that one way of increasing dependability, among many, is to subject the study for checks by experts of which in the context of this study the supervisor oversaw the plan and implementation of the research.

3.5.6.3 Confirmability

In qualitative research, objectivity of neutrality of data is referred to as confirmability (Lincoln & Guba 1985: 318). The research methodology was explained

comprehensively and also used peer examination. The supervisor acted as a co-coder and a meeting between the supervisor and the researcher was held as a consensus following data coding, to verify the themes. This was one way of ensuring that the interpretation of data was not just the researcher's imaginations (Mertens 2010:260).

3.5.6.4 Transferability

Lincoln and Guba (1985:16) describe transferability as the applicability of the research results to another context or with other participants. The major purpose of Phase I findings was to inform the development of data collection instrument for Phase II other than transferability. Even though the results from Phase I were not generalisable to the wider population of rural radiographers, they may be generalised after integration into the quantitative data obtained in Phase II of the study. This is because the researcher, in Phase II, used a larger sample to ensure that maximum information which is rich is obtained.

3.6 LAST PART OF PHASE I: SURVEY INSTRUMENT DEVELOPMENT

The exploratory phase according to Creswell and Clark Plano (20011:187) may, in some exploratory study designs, be followed by instrument development phase. These authors suggest that a mixed methods researcher may use the themes from the qualitative stage to find published instruments for stage two of the study. Nonetheless, the researcher did not find published instrument that could be applicable to this study.

Consequently, the last part of Phase I involved instrument fidelity, which means development and maximizing the utility of the quantitative data collection instrument (Onwuegbuzie, Bustamannte & Nelson 2010:58). The developed instrument was thus given to the focus group for evaluation. The study promoter, statistician and other research experts were requested to check for content reliability. The newly constructed instrument was then pre-tested on the group of radiographers working with the researcher (Delport 2005:171). This approach is also supported by Boynton (2004:172) who is of the opinion that a questionnaire must be pre-tested on participants who are representative of the sample.

3.7 PHASE II: QUANTITATIVE APPROACH

Phase II of this study used a quantitative approach in the form of a survey. (See Figure 3.1). Literature suggests that surveys may be used for the purpose of describing, developing theory or identifying problems with current practice (Babbie 2007:244; Burns & Grove 2005: 232; Talbot 1995:50). This is in line with Burns and Grove (2005:233) who argue that descriptive studies utilize surveys to describe and identify areas of concern.

3.7.1 Descriptive survey

In order to identify and describe the phenomenon of a population, such as additional core competencies needed by radiographers working in rural hospitals, a descriptive cross sectional survey study was undertaken in Phase II of the study. Bowling and Ebrahim (2005:190) are of the view that descriptive surveys are carried out in order to describe population attributes, such as knowledge, perceptions behaviour, attitudes or health aspects. Bowling (2009:216) note that the extent of changes, impact, any shift or challenges encountered, in this case rural health service provision over time, will remain unknown without the documentation of surveys. Moreover, a content analysis of 232 social science articles in which qualitative and quantitative approaches were combined revealed that a cross sectional survey appear to be commonly used in the quantitative phase (Bryman 2006:97).

To this effect, Phase II as a survey study building on the results from Phase I, was aimed at providing statistical information about rural radiographers' additional core competencies and challenges. This is because in-depth exploration of the additional core competencies that may be required in rural areas and challenges was not possible using this method alone. Hence the inclusion of Phase I which was aimed at generating information for the questionnaire and adding depth to the survey results other than just contributing towards the formulation of survey questionnaire.

3.7.1.1 Advantages of a descriptive survey

The advantages of a descriptive survey study include:

- The potential of a survey is that one is able to collect data from a large sample size and also be able to generalise to a larger population, though this is only achieved through appropriate sampling and high measurement reliability (Bankins 2011:357; Mouton 2001:153). Although census sampling was used in this study, it is believed that findings can be generalised to the whole of KZN rural radiographic population.
- A key and powerful characteristic of the survey is its ability to characterise the opinions and behaviours of the population quantitatively in a way that permit uniform interpretation (Kasunic 2005:42). This applies especially to closed ended questions.
- A descriptive study provides valuable baseline information. This study could serve as a point of departure for similar studies with other health disciplines working in rural hospitals. Furthermore, it could also serve as a basis for replicated studies.

3.7.1.2 Disadvantages of surveys

There are also a number of disadvantages associated with surveys. Among them:

- Information derived from a survey study tends to be superficial because of the failure of interviews and questionnaires to probe into such complexities as human behaviour and feelings (Polit & Beck (2008:234). This weakness was in some way mitigated by the inclusion of Phase I of the study.
- In a survey study, a researcher cannot infer a cause-effect relationship (Bowling 2009:216). This is true but clues for cause-effect provided in this study may provide a foundation for further studies.
- Response rates in postal or email surveys are usually low. To improve the response rate, the researcher contacted and requested radiographers' in-charge of the x-ray departments to receive questionnaires and distribute to the other radiographers in their respective departments and post them back once completed. Other health professionals known to the researcher at some of the hospitals also assisted to this effect.

3.7.2 Phase II: Study population

Joubert and Katzenellenbogen (2007:94) insist that it is essential to define clearly the target population about which the researcher wants to collect information. For the purpose of this study the target population included all radiographers working in rural district hospitals of KZN. In exploratory sequential design, the respondents in the quantitative phase are not the same with those who provided data in the qualitative phase (Creswell & Plano Clark 2011:188), but are drawn from the same population.

3.7.2.1 Phase II: Sampling method

In a cross-sectional study design, a researcher can either select the entire population of a subset from which data can be collected (Olsen & St.George 2004:7). In the context of this study there were few radiographers working in Level 1 hospitals which are mainly in rural areas. In a situation where the population is small, Kasunic (2005:32 suggest that a researcher should consider using a census sampling. In a census sampling method according to the same author, all units in the population are included in the sample. In Phase II of this study the researcher used a census method by including all radiographers working in Level 1 hospitals in rural areas of KZN. Moreover, Onwuegbuzie and Collins (2007:284) notes that non-random sampling technique is the most common method used in mixed method research regardless of the research goal.

3.7.2.1.1 Advantages of a census sampling

- In a census sample there is no sampling error and biasness which is introduced when the sample drawn from the population is not representative (Kasunic 2005:23).
- It provides information on all individuals in the population (Kasunic 2005:23). In the context of this study this strength assisted in the generalisation of the results to all the radiographers working in rural KZN hospitals.
- A census sampling is more inclusive which means it affords the entire

population an opportunity to participate in the study (Parker 2011:4; Kish 1979:101), In Phase II of the study all radiographers working in all level 1 rural hospitals in KZN were given an opportunity to participate. This, for instance, allowed for collection of better demographic data about the population (Parker 2011:4).

3.7.2.1.2 Disadvantages of census sampling

- Parker (2011:5) suggest that there is increased expectation from a census sample who wants to see the link between what they reported in the survey and the implementation. The researcher intends to use this increased expectation from radiographers to foster cooperation and support for the possible implementation of the proposed CPD strategy.
- May require longer administration time (Parker 2011:4). In the context of the study the researcher used both postal and hand delivered methods to reduce questionnaire administration time.

3.7.2.2 Phase II: Sample size

The quantitative phase in the exploratory sequential design requires an adequate sample in order to allow for statistical tests (Creswell & Plano Clark 2011:188). In order to recruit an adequate sample the researcher used census sampling. The number of identified Level 1 rural hospitals at a time of the study was 38. A total of 135 radiographers worked in these hospitals. The sample size for this study was therefore 135 since a census sampling method was used.

3.7.2.3 Inclusion criteria for Phase II respondents

Inclusion and exclusion criteria were set for probable Phase II study respondents. According to Stommels and Wills (2004:305) inclusion and exclusion criteria are a way of defining who is eligible to become a participant and who is not. In this phase the following were included:

- All radiographers working in rural hospitals of KZN province regardless of rank or work experience.

3.7.2.4 Exclusion Criteria for Phase II respondents

Exclusion criteria is described as characteristics that a respondent may have which could affect the accuracy of the results (Brink 2006:148). Thus, in addition to the exclusion of those radiographers working in tertiary or regional hospitals, the following were also excluded;

- Radiographers who participated in the focus group interviews in Phase I
- Supplementary diagnostic radiographers and darkroom operators

3.7.3 Phase II: Data collection method

The data collection instrument was developed mainly from the results of qualitative analysis in Phase I. In the development of the survey data collection instrument, the researcher considered items and scales that would best measure the themes that emerged from the qualitative results.

The questionnaire for this study consisted mainly closed and structured questions where respondents could indicate different options provided on the questionnaire. This allowed for numerical values to be assigned to responses. Furthermore, closed questions or structured, according to Denscombe (2007:166), allows for the respondents to answer from categories that have been established in advance. Based on the results of Phase I, different types of measurements namely ordinal and intervals were included in the questionnaire. For the purpose of this study both dichotomous questions and a 4-point Likert scale was used for Likert items. In the case of Likert items, evidence from literature suggests that there is no specific rule that provides for a specific length of response scales (Johns 2010:6). A few open ended questions were included. (See annexure VI).

3.7.3.1 Likert items

Boone and Boone (2012) identify two types of Likert data namely Likert type items and Likert scale each requiring a unique data analysis procedure. The difference between the two types is that Likert type items are single questions that use some

kind of original Likert response alternatives while Likert scale is made up of a series of four or more Likert–type items and are added up into a single composite score during data analysis (Clason & Dormody1994:32). Literature reveals that it is important for the researcher to be familiar with the difference between Likert type and Likert scale data as this helps the researcher to decide on an appropriate statistical procedure (Boone & Boone 2012).

For the purpose of this study, the researcher decided to combine Likert items into Likert scale. The rationale for combining the items into Likert scale in the context of this study was on the assumption that items in the questionnaire were dispersed in order to interrogate different viewpoints on the same variable or construct. In the same vein, other authors have even referred to Likert scale as 'summated' scale because answers given by respondents are summed up to give an overall score on the value or variable (Brown 2011:11; Johns 2010:8).

Thus, for the purpose of this study, the researcher used Likert scale items for section 2.1 A – F, section 3 A and section 4 A and B. In fact Likert scale can, strictly speaking be considered as ordinal in nature but according to Castleman (2007:94) researchers considers them as interval for the calculations of parametric and significance testing. Contrary to Castleman's argument several authors have argued that in Likert scaling there is an assumption that there is an underlying unobservable (latent) continuous variable (Allen & Seaman 2007:65; Classon & Dormody 1994:31; Van Alphen, Halfens, Hansman & Imbos 1994:197). This, according to Brown (2011:11) allows for Likert Scale to be analysed as an interval scale.

3.7.3.2 Advantages of a structured data collection instrument

The structured data collection instrument was used in Phase II of the study because of the following advantages;

- Stommel & Wills (2004:163) identifies the possibility of attaching numerical values to response categories as one advantage of this type of questions.
- Coding of structured questions is easier.

- Collected data can be analysed quantitatively and it's a relatively cheap method
- Structured questionnaire caters for many respondents

3.7.3.3 Disadvantages of a structured questionnaire

A structured questionnaire is not without disadvantages. Some of these disadvantages include:

- A structured questionnaire may not easily cover all answers. According to Babbie (2007:2460) the researcher, for instance, may overlook some important issues as the responses are limited. The impact of this challenge is likely to be reduced since the variables and categories will come from Phase I analysis. Furthermore a few open-ended questions were included.
- Bless & Higson-Smith (2000:119) points out the restriction of the number of possible answers as a weakness of the structured questionnaire. Some questions included space for ''other'' to cater for answers that may not have been included.

3.7.3.4 Curriculum audit instrument

The audit instrument was used to help in the analysis of a curriculum. Since the investigations of additional core competencies of radiographers working in rural areas were the focus of this study, categories on the curricula audit checklist were appropriate to the profile of the rural diagnostic radiography area and were based on the literature and results of both qualitative and quantitative data analysis. The audit instrument was a modified version of curriculum audit instrument developed by the FDTL 5 Enhancing Graduate Employability Project Team (www.enhancingemployability.org.uk). The audit procedure is outlined in detail in Chapter 6.

3.7.3.5 Development of proposed CPD strategy

Development of a proposed CPD strategy was part of Phase II of the study. The

proposed CPD strategy was based on the results obtained from both qualitative and quantitative data analysis. Since strategy development, according to Muller, Bezuidenhout and Jooste (2011:57), is based on a process of trustworthiness the researcher consulted and also involved stakeholders namely; expert evaluators both in clinical areas and the academia. One senior participant from the initial phase and the study supervisor were also requested to evaluate the strategy. The CPD strategy is discussed in detail in Chapter 6.

3.7.3.6 The Questionnaire

The importance of questionnaire layout is not only confined to ensuring that all questions are answered, but it also helps in data coding and analysis (Williams 2003:248). Furthermore O'Connor and Halkett (2010:9) write that a crowded and messy questionnaire puts people off. The questionnaire was divided into sections, each dedicated to the themes and categories that emerged from the analysis of the first phase and literature review. Section 1 dealt with demographic data while section 2 elicited other aspects for example respondents' knowledge about planning, critical thinking and ethics in radiography. A copy of a questionnaire is attached as annexure VI.

The introductory letter (Annexure VII) accompanied the questionnaire. A good and concise introduction which outlines briefly what the questionnaire is about is essential to get participant interested (O'Connor & Halkett 2010:9).

3.7.3.6.1 Questionnaire language

Although standardized data collection in any type of questionnaire is encouraged, language and the anticipated variation of educational background of respondents had to be taken into consideration in this study. The questionnaire was in the English language only, because by far the majority of the respondents used English language as a medium of communication during the pre-service training. Furthermore, English language is commonly used in hospitals as a medium of communication.

3.7.4 Phase II: Data collection procedure and administration of data collection instrument

Babbie (2007:256) identifies three methods of administering questionnaires to the respondents. These include: self-administered questionnaire or by telephone using a structured questionnaire, hand-delivered, postal or by e-mail.

Two methods were used namely postal and hand-delivery. E-mail method was not used because of confidentiality issues. For postage, the researcher first contacted the radiographers-in-charge and other health professionals known to the researcher. The researcher requested them to receive the questionnaires and distribute them to the radiographers in their respective hospitals. A self-addressed pre-paid envelope was enclosed for ease return. This way assisted in the follow up for those questionnaires which were not returned. The researcher simply telephoned the concerned radiographers-in-charge to remind them about the delay.

3.7.4.1 *Advantages and disadvantages of postal questionnaire*

One of the advantages of the postal questionnaire is that there is no possibility of interviewer bias since there is no interview and respondents have a high degree of freedom when completing the questionnaire (De Vos 2005:172). Besides, mailed questionnaires can cover a wide area.

The disadvantage of mailed questionnaire is that it may take long to be returned. There is also low response associated with non-return of questionnaires. The purpose of contacting radiographers-in-charge and health professionals known to this researcher to receive and distribute the questionnaire was to mitigate this challenge. For unreturned questionnaire the researcher knew who to contact.

3.7.5 PHASE II: MEASURES TO ENSURE VALIDITY AND RELIABILITY

3.7.5.1 Validity

The validity of a measuring instrument, according to Delport (2005:160), is when the

instrument actually measures the concept in question and that the concept is measured accurately. Other researchers, such as Elasy and Gaddy (1998:757), view validity as the extent to which an instrument measures what it intends to measure. In this regard, the researcher attempted to develop a simple and understandable questionnaire as a way of enhancing validity. This is because Stommel and Wills (2004:158) argue that validity of surveys relies heavily on respondents' willingness and ability to report their perceptions accurately.

3.7.5.2 Content validity

Rosnow and Rosenthal (2005:141) describe content validity as the adequate sampling of the relevant material or content that the measuring instruments purports to measure. While Babbie (2007:147) refers to content validity as the extent to which the measure covers the range of meanings included within the concept. Other than giving the questionnaire to evaluators, it was also pre-tested on a group of radiographers working with the researcher. This was done to enhance content validity. The responses from the pre-tesing sample were used to evaluate the clarity of the questions. Furthermore the focus group participants were also asked if there were areas of importance which they thought the questionnaire did not address from the discussion. Marshall (2005:135) relates this process to content validity.

The items in the questionnaire used in this study were based on the results obtained from Phase I data analysis. The aim was to use as much of the information obtained from the discussion with the focus group in Phase I in the development of the questionnaire. Furthermore, the researcher approached experts in the field, in this case radiography, to make judgment about the content validity of particular questions as suggested by (Stommel & Wills 2004:222). Therefore, in order to ascertain the instrument validity it was subjected to evaluation and proof reading by study supervisor, radiographic academicians and the radiologists (Mung'omba 2011:18).

This exercise allowed for corrections to be made to areas of the questionnaire that were either ambiguous or difficult to understand by respondents. Based on the responses from the pre-testing sample and comments from the group of experts, changes and adjustment were made to questions 3 and 42. For instance, most of the

pre-tested sample said that question number 42 was not clear. Changes were made to this question accordingly. Five items were completely removed from the original questionnaire as a result of this process and also the input of the supervisor.

3.7.5.3 Face validity

The degree to which an instrument gives an appearance that it is measuring something relevant is referred to as face validity (Brink, H, Van der Walt, C & Van Rensburg, G. 2012:166). In this study face validity was used to make sure that the questionnaire was readable and the content was clear. To ensure face validity the researcher requested the participants of focus group to evaluate it and interviewed them after they evaluated the questionnaire.

3.7.5.4 Reliability

According to Delport (2005:162), reliability, is concerned not with what is being measured but with how well it is being measured. Terre Blanche *et al* (2006:152) on the other hand define reliability as dependability of the measurement instrument thus the extent to which the instrument gives the same results when repeated. For the purpose of this study, the statistician was used to compute reliability. Constructs that composed of items related to core competencies obtained a Cronbach alpha value ranging from 0.68 – 0.87 except for the two construct related to radiography training and the role of CPD in rural areas which obtained a Cronbach alpha value of 0.59 and 0.41 respectively (Table 5.12). The Cronbach alpha values of the five construct indicate reliability.

Boynton and Greenhalgh (2004:1313) suggest that the format of the questions must be standardised in order to increase reliability. The role of anonymity of participants was also used to increase the reliability (Mung'omba 2011:18). In this study, it was achieved through the use of a well written introductory letter that accompanied questionnaires and telephonic explanation to those who were selected to receive and distribute questionnaires in each x-ray department. Assurances that responses given will not be tied to any one's name were given to the respondents. Furthermore respondents' were requested not to provide any personal identification information.

Clear conceptualisation of the construct and a precise level of measurements further enhances reliability (Delport 2005:163). To strengthen instrument reliability, clear definitions of constructs were provided and also using a 4-point Likert scale, in sections where Likert questions were used, to increase sensitivity of the measurement.

3.7.5.5 Acceptability

When pre-testing the instruments, the researcher requested respondents to write their comments about the questionnaire. This is in line with some authors who propose that qualitative methods can be used to test the acceptability of the questionnaire (Williams 2003:249).

3.7.6 PHASE II: DATA ANALYSIS

The researcher must reduce and organize data by conducting data analysis in order to give meaning to the collected data (Burns & Grove 2005:63). This argument is supported by other authors who write that the purpose of data analysis is to reduce data to an intelligible and interpretable form (Brink, *et al* 2012:177; Kruger, De Vos, Fouché and Venter 2005:218). In this study, Microsoft Excel for Windows 2010 and Epi-Info version 7.1.5 statistical software were used for both data capturing and statistical analysis. Both descriptive and inferential statistics were used. According to Denscombe (2007:253) descriptive statistics if properly used can offer the researcher precise way of:

- Summarising the results
- Organizing data
- Displaying the evidence
- Exploring connections between parts of data

By using inferential statistics, on the other hand, the researcher sought to discover relationship among and between demographic variables namely; gender, rank, grade, work experience and educational level and other variables. Similarly, Brink *et al* (2012:179) write that inferential statistics are used to draw inferences about the population under study. In the context of this study, a two groups' comparison t-test

and one way analysis of variance (ANOVA) was used to determine the influence of biographical variables.

Likert items were combined to yield a composite score. This approach is supported by Boone and Boone (2012) who noted that combining the items during data analysis provides a quantitative measure of a character or construct in the case of this study. Evidence from published literature reveals that placing emphasis on quantitative phase yields quantitative dominant mixed method data analysis (Onwuegbuzie & Comb 2011:6). Even though this study may have yielded quantitative dominance, as mentioned earlier, the results from the qualitative data analysis in Phase I and quantitative data analysis in Phase II were complimentary and hence given equal importance.

3.7.6.1 Data coding and data entry

Data coding is defined as a way of transforming data into a standardised form (Babbie 2007:325). While Williams (2003:249) considers coding as a process by which questionnaire data is converted into numbers or categories. According to Babbie (2007:422) a researcher must engage in coding the data that has been collected in order to allow for quantitative analysis. The researcher attributed a number to each group in order to transform and allow data to be analysed quantitatively.

3.7.6.2 Data cleaning

The researcher undertook the data cleaning process after all the questionnaire responses had been entered. This was aimed at identifying inconsistence or outliers. One of the methods used to clean data was to produce frequency figures for each question. Any outliers were identified and examined.

3.8 ETHICAL CONSIDERATION

Mosby's Medical, Nursing and Allied Health Dictionary (2002:416) define ethics as the study or science of moral values or ethical principles which include beneficence,

justice and autonomy. And in terms of acceptability of the study, Johnson and Christensen (2009:102) explain that a researcher needs to balance the cost between the benefit that may result from the study. In this study the researcher considered the cost in terms of harm to respondents against the benefit that may result from the study such as knowledge advancement. The consideration was based on the following principles with regards to ethics.

3.8.1 Permission to conduct a study

The research proposal was submitted and permission was sought from UNISA's ethics committee. The ethics committee approved the study and issued the Ethics Clearance Certificate (see attached Annexure I). Application for permission to conduct a study on the rural radiographers was also submitted to KZNs' Health and Knowledge Management through the chairman of Institutions' Education Training Committee (IETC) at the hospital. Permission was granted (see Annexure II). Application was also submitted to one of the University of Technologies for permission to analyse the radiography training curriculum. Permission was granted (See Annexure III).

3.8.2 Participants' consent

When inviting the study participant to take part, adequate description of what it entails to participate and information about the study were given. In the case of focus group participants oral consent was obtained before the discussion. For the survey respondents it was mentioned in the covering letter that acceptance and completion of the questionnaire constituted consent by the participant. In both phases of the study participants were informed that participation in the study was voluntary and that they had a choice either to take part or opt out.

3.8.3 Justice

The principle of justice is concerned with the right to privacy and fair treatment of respondents in the context of research participation (Polit & Beck 2008:174; Stommel & Wills (2004:377). All responses were collected anonymously in order to

protect participants' right to privacy. Anonymous data collection was used to avoid linking information to a particular participant or respondent. The researcher achieved this through omission of identifying information such as names, addresses or telephone numbers

Although the interviews in the first phase were audio-taped the topic under study was not classified as being sensitive. Moreover all participants were 22 years old and above (Ivankova 2002:62). The anonymity of participants in the focus group was maintained by giving them fictitious names and no names were used in the analysis and reporting.

3.8.4 Autonomy

The research participants have the right to full information and self-determination with regard to study participation (Stommel & Wills 2004:380). The focus group respondents were informed about the study before being invited to participate. Thereafter oral consent was sought. Participants in the first phase of the study were given option either to take part or not while those in the survey were informed about this option through the covering letter. Furthermore, those respondents who took part were informed that they were free to discontinue at any time. And also that they were at liberty not to answer any question that they felt they did not want to answer.

3.8.5 Beneficence

Beneficence is described by Stommel and Wills (2004:377) as the principle of refraining from exploitation of research respondents and doing no harm to them. Apart from ensuring that the well-being of respondents is secured, the researcher should ensure that participant's decisions are respected (Amir Sing, Kagee & Swartz 2007:32). The participants especially those in focus group were treated in a proper manner and were also protected from discomfort. All respondents, in both phases of the study, were not coerced into taking part by any means. The participants were informed that this study was for academic purposes and as such there were no monetary or other benefits for taking part. However, it was envisaged that results of

the study may be implemented in a way that the study population could benefit from it.

3.9 CONCLUSION

As indicated in Chapter 1, section 1.11, this chapter reflects the integrated model of thesis presentation in mixed methods research. In this chapter methodologies of both qualitative phase and quantitative phase are discussed. The chapter also provided the description of study population, sampling and sample size, data collection, validity and data analysis and interim phase. The ethical aspect of the study was also outlined.

CHAPTER 4

DATA ANALYIS, PRESENTATION AND DISCUSSION FOR PHASE I

4.1 INTRODUCTION

As indicated in Chapter 3, Phase I of the study was aimed at exploring the phenomenon regarding additional core competencies required by radiographers working in rural areas of South Africa. To achieve this, eight open-ended questions (Annexure IV) were asked in a focus group comprising of seven participants. Phase I of the study therefore involved the collection of qualitative data through a focus group.

In this chapter the researcher discusses qualitative data analysis, interpretation and data are discussed in view of the literature reviewed in Chapter 2. Analysis of data, solicited by using mixed methods, involves the use of qualitative and quantitative methods separately (Creswell and Clark Plano 2011:205). The information gained from the analysis of the focus group interview and field notes was used in the development of the data collection instrument for Phase II of the study.

The discussion and presentation of the findings is not necessary structured according to the way interview questions appear on the questionnaire but according to the themes that emerged from the analysis. Four themes emerged from data analysis. These themes were presented to the participants and to the study supervisor during consensus meeting. After the consensus meeting it was resolved that one theme be converted to a category. For the purposes of this study, only one focus group consisting of participants with diverse characteristics (Table 4.1) was used to provide data for exploratory phase. A single focus group was used mainly to help provide data to be used in the development of a Phase II data collection instrument.

4.2 ANALYSIS, RESULTS AND DISCUSSION OF THE QUALTTATIVE DATA

Data were collected from a single focus group interview, comprising of seven

radiographers working in the rural district hospitals of UMkhanyakude health district of KZN Province. For analysis purposes, the interview was transcribed from voice recorded format into text form using the services of professional transcribers. The transcription resulted in 31 pages of text.

The most important feature of qualitative data analysis is the focus on text rather than on numbers (Schutt 2011:321). In order to understand data, the researcher enacted a close reading to familiarise himself with the transcribed text. This was done by searching through the transcribed data looking for statements and quotes which, according to Padgett (2012:35), are normally emblematic in meaning. According to the same author these emblematic statements and quotes can be grouped into themes. Similarly, the researcher began by identifying emerging themes in relation to the study objectives. These themes were assigned codes of a letter and a number. For example, the first theme was coded as T1 and the second theme as T2. The rationale to begin by the identification of major themes first and assigning codes was to provide direction of what the researcher should look for in the transcribed data and field notes. The researcher then used transcribed data and field notes to search for the text that matches the major themes. These texts that matched the themes were then grouped into categories and subcategories. During the analysis the researcher also paid attention on the difference in participants responses so as to be able to form categories for topology to be used when developing survey instrument (Creswell & Clark Plano 2011:236).

As described in Chapter 3 (Section 3.5.5) the identified themes, categories and subcategories were presented to both the participants and the study supervisor for validation. This process resulted in some changes to the four themes that the researcher had identified earlier. The consensus was reached that one theme namely ‘challenges encountered by radiographers practicing in rural KZN’ should be included under major theme 1 as a category. The three themes and their corresponding categories and subcategories are presented in the Tables 4.2, 4.3 and 4.4 under subsections 4.2.3, 4.2.4 and 4.2.5 respectively. In the context of this study, all quotations from study participants are indicated in italics.

4.2.1 Demographic characteristics of focus group participants

Table 4.1 shows the demographic profile of the participants of the focus group. The group comprised participants with varied characteristics within the radiography profession. Their work experience ranged from four years to more than ten years. There were more female participants (57.1%) than males. Three (42.8%) participants had seven years of work experience and two (28.6%) had more than ten years of work experience while the remaining two had five years and less experience. The focus group participants represented all ranks, from entry rank namely production to the senior rank namely assistant director radiographer. The majority of the participants (42.8%) were chief radiographers. The remaining ranks had two (28.6%) participants each. The rationale for selecting a diverse group was to gain a variety of insights, opinions, perceptions and ideas about core competencies required by radiographers working in rural areas. Brooks, Fletcher and Wahlstedt (1998:27) are of the view that using a focus group with diverse characteristics enhances data validity.

Table 4.1 Demographic characteristics of focus group participants (n=7)

CHARACTERISTIC	VALUE	FREQUENCY	PERCENTAGE
Gender	Male	3	42.9
	Female	4	57.1
Rank	Assist. Director	2	28.6
	Chief	3	42.8
	Production	2	28.6
Work experience in rural district hospital	4 years	1	14.3
	5 years	1	14.3
	7 years	3	42.8
	More than 10 years	2	28.6

4.2.2 Focus group interview

The participants in the focus group generally reacted spontaneously to questions and almost all who participated in the discussion did it in a lively way. Two participants appeared to be a little bit shy. Participants were able to interact and support one

another's views thereby demonstrating one of the effects of a focus group interview (De Swardt 2012:57).

As indicated in the introduction of this chapter, the four themes identified were reduced to three themes. These themes were as follows:

- Theme1: The environment in which rural radiographers practice radiography.
- Theme 2: Radiography training and rural radiographic practice.
- Theme 3: Views of rural radiographers on CPD as a lifelong learning concept.

Each theme and corresponding categories and subcategories are presented in individual tables followed by discussion. In order to substantiate the results the researcher occasionally added quotes from the participants.

4.2.3 Theme 1: The environment in which rural radiographers practice radiography.

The context in which rural radiography is practiced appears to be broad as deduced from the focus group interviews. From the beginning of the discussion there was a unanimous agreement among the participants that the practice of radiography in rural hospitals was different from the way it is practiced in major urban hospitals.

Table 4.2 below indicates major theme 1 and the corresponding categories and subcategories that emerged from qualitative data analysis.

Table 4.2: Theme 1: The environment in which rural radiographers practice radiography

Theme	Category	Subcategory
Theme 1: The environment in which rural radiographers practice radiography	Inappropriate use of x-rays	▪ Lack of properly organised X-ray services in rural areas ▪ Requesting of x-rays examinations in rural hospitals ▪ Patients' demand for x-ray examinations
	Teamwork	▪ Radiographers' role in the healthcare team ▪ Doctors do not follow procedures
	Attitude and behaviours	▪ Respect between radiographers and other rural healthcare professionals ▪ Showing respect and having patience for rural patients' cultural beliefs
	Communication in rural radiography practice	▪ Communication between radiographers and rural patients ▪ Communication between radiographers and other health professionals
	Outreach programme	▪ Introducing outreach programme ▪ Dissemination of information about x-rays
	Differences between rural and urban radiographic practice	▪ No modern equipment ▪ Doctors seeking the radiographers' opinion on x-ray images ▪ Routine or boring work as part of rural (boring) ▪ No specialists
	Challenges encountered by radiographers practicing in rural KZN.	▪ Luck of appropriate competencies ▪ Lack of proper staff orientation ▪ Outdated equipment ▪ Luck of appreciation of radiographer's role ▪ Need for representation in broader management

4.2.3.1 Category: Inappropriate use of x-rays

Under this category, seven subcategories were identified. These subcategories are discussed in the following subsections below.

4.2.3.1.1 Subcategory: Lack of properly organised x-ray services in rural areas

In this subcategory the focus group participants stated that health operations and the general work systems in rural hospitals were usually not systematically organised especially when it comes to the practice of radiography. One participant explained that the practice of radiography at their hospital can be said to have no order. Supporting this view, another participant shared the following about the organisation of x-ray services in rural hospitals

> ''*At our hospital they just bring patients from the wards at any time. While in cities they respect the booking time. If they say they will be seeing ward patients in the afternoon everyone sticks to that.''*

The above comment is in support of the notion that the working environment in rural hospitals is very different in many ways from that in bigger urban hospitals. These participants' views are also supported by literature which notes that urban healthcare is well organised and supported as compared to that in rural areas (Cooke *et al* 2011:108). The participants disclosed that healthcare system in rural areas tends not to be well organised and this further frustrate the radiographers who appear not be aware of what is expected of them once they are posted to these rural hospitals. This disappointment is evidenced in one of the participants comment:

> *''…supposed to fill in an NSI form and I didn't know and I had to ask my junior staff…..I was clueless and my junior staff had to do it for me.''*

NSI stands for Non Stock Item. This is normally a form that an end user such as a radiographer needs to complete when requesting the hospital to purchase an item such as equipment which is not usually stocked in the hospital stores.

The foregoing view from the participants is an indication that rural health care services can sometimes be complex with a myriad of systemic challenges. This comment

further reveals that the specific participant was not aware of the processes and procedures involved in rural healthcare services when one needs resources or items to use for the work purposes. To this effect, some authors have suggested that in order for rural radiographers to perform efficiently they are expected to understand the complex pathways and systems of healthcare delivery which differs from the urban facilities (Hall *et al* 2008: 417; Swanwick & McKimm 2011:22). Chances are that radiographers may not have been exposed to these pathways and systems during the pre-service training.

4.2.3.1.2 Subcategory: Requesting of x-ray examinations in rural hospitals

The interviews revealed that radiographers in rural areas perform many x-ray examinations most of which are not necessary. The view of all the focus group participants was that the majority of rural doctors' request x-rays for almost all patients they see regardless of the patient's clinical condition. This assertion is reflected in the participants' comments below:

> *''....in rural hospitals doctors are just chasing the patients from OPD by sending them to radiographers for unnecessary x-ray examinations. .....in rural areas doctors just order the x-rays without examining the patient.''*

> *''... maybe the problem with the patient is only ankle joint but the community service doctor will request the whole leg.''*

Another participant added that:

> *''....as long as you have blood even if the patient cut himself or herself with a razor that patient will be sent for an x-ray by a nurse. That is rural friends.''*

The ordering of unnecessary x-rays by rural doctors is evident in literature. And Ferrante di Ruffano *et al's* (2012:e686) observation regarding ordering of x-rays by doctors bear specific relevance to these findings. These authors noted that sometimes doctors may order an x-ray examination which is not necessary but just to reassure and satisfy the patient. The participants further mentioned that such experiences make the provision of conventional radiography in rural areas even more difficult. Ordering of unnecessary x-ray examinations is a challenge that may require rural radiographers to

apply additional competencies other than those obtained at a point of graduation to address the problem. For instance a rural radiographer may need to apply problem solving strategies to change the *status quo*.

4.2.3.1.3 Subcategory: Patients' demand for x-ray examinations

Participants also noted that rural patients do also contribute a lot towards inappropriate and unnecessary x-ray examinations. Participants mentioned that most rural patients have so much trust in the ability of x-ray such that they demand to have an x-ray taken regardless of their medical complaint. Below is a quote from what the doctor told one of the participants when he approached the doctor to discuss about the justification of the x-ray examination the doctor had just requested:

> *''…yes but sometimes you know these patients, ……I was just doing it so that the patient will feel happy.''*

The discussion on patients' demand for x-ray examinations by rural patients brought to the fore strange requests that rural radiographers receive. One participant mentioned that one patient went to the x-ray department asking for x-ray examination to check why his eye was twitching. According to another participant, such things where the patient comes to straight to the x-ray department asking to be examined do not happen in urban hospitals. However, the demand for x-ray examinations by patients is very common in rural areas. Similar findings of rural patient's demand for x-ray examinations were revealed in a study that was conducted by Mung'omba and Botha (2012:19) on the factors influencing patients' demand for x-ray examinations in rural KZN. It is important to note that radiographers do not encounter such experiences during their pre-training practical work. This is because their practical work is done in big urban hospitals where the majority of patients are educated.

4.2.3.2 Category: Teamwork

From the focus group interview it was evident that teamwork was an important component of radiographic practice in the context of rural working environment. Radiographers who participated in the focus group described themselves as members of the rural healthcare team in their own right. One participant simply put it:

''...honestly speaking they can't survive without us radiographers and other health workers.''

''The bottom line is that we need each other.''

With regard to rural radiographers, the participants felt that it was important to be part of the healthcare team. This finding is in support of Perumal (2012:355), a community service medical officer, who noted that the culture of team work and co-dependence of healthcare workers in rural hospitals is one thing that lacks in urban context.

However, despite the majority's view that there was need for radiographers to be equipped with skills on how to work within the healthcare team some participants felt that other health disciplines such as doctors and nurses do not consider radiographers as members of the healthcare team. Some of the participants were of the opinion that radiographers themselves do not work in a team. One of the participants said:

''*Many times we radiographers don't even work as a team in our own departments.''*

This finding reveals that radiographers may not have been exposed to the importance of teamwork during pre-service training. This is in contrast with published literature which suggests that it is important that healthcare professionals, including radiographers, are well prepared for teamwork environment since multidisciplinary approach has an impact on the patient outcome (Leggat 2007). This implies that a radiographer may require a specific set of competencies to enable him or her to work within the multidisciplinary team (Suter *et al* 2009:41). Elsewhere, teamwork is one of the core competencies that have been identified by IOM for inclusion in the training curriculum for allied health professionals of which radiographers are part (Blagg 2009).

4.2.3.2.1 Subcategory: Radiographers' role in the rural healthcare team

The competency framework (Figure 1.1), which was developed for this study places radiographers in the centre which emphases the importance of collaborating with other rural healthcare team members to provide quality diagnostic imaging. The participants also acknowledged their role in the rural healthcare team.

Even though most of the participants' views acknowledged that radiographers have a role to play in the rural healthcare team, others had different views. These different views stem from non-appreciation of radiographers' role by other rural health professional, such as doctors, in real clinical environment. Participants with different views felt that other health professionals especially doctors do not really acknowledge the importance of the role played by rural radiographers. It is important however to note that the majority of the participants were of the opinion that rural radiographers have an important role to play in the management of patients and therefore they are an integral part of the rural healthcare team.

4.2.3.2.2 Subcategory: Doctors do not follow procedures

Although the success of the team hinges on the collaboration between team members, participants disclosed that doctors in rural hospitals appear not to follow and respect the policies and guidelines that govern radiography practice.

> *''.....doctors don't use the proper procedures when it comes to us in rural areas.''*

The comment above suggests that rural radiographers may find it difficult to effectively discharge their duties within the team as they may consider other team members not to care about the guidelines and policies that govern their profession. This observation is supported by published evidence which show that radiographers have encountered thwarted influence attempts in a multidisciplinary team (Williams *et al* 2015:167). This kind of situation is likely to bring despondent among the radiographers and thereby encouraging resentment of rural areas by radiographers. It may also influence the way radiographers participate in the rural healthcare team. Suter *et al* (2009:41) notes that the ability of a rural radiographer to work in a team to provide diagnostic imaging requires a specific competency. Resentment of rural areas by radiographers due to thwarted influence by other health professionals can only be overcome by equipping rural radiographers with additional competencies many of which are generic and may not have been covered in the pre-service training curriculum.

4.2.3.3 Category: Attitude and behaviours

The focus group participants gave their views and opinions regarding the attitudes and behaviours required by radiographers working in rural areas of KZN. The interviewees were of the opinion that the individual radiographer's training background and the way one has been raised was likely to influence one's attitude and behaviour towards patients and staff. However, the participants' views were that the required attitudes and behaviours for rural radiographers should be instilled in them taking both health professionals and patients into account. This is reflected in the two subcategories that emerged under this category. The two subcategories are discussed below.

4.2.3.3.1 Subcategory: Respect between radiographers and other rural healthcare professionals

In the focus group discussion it came out that the rural radiographers' attitude and behaviours hinge on the respect and good relationship between radiographers and other health care workers especially doctors. The following data reflect this:

> *''How can we work together when they don't respect us especially the doctors? For instance, one day I went to ask the doctor for clarification on what he meant on the x-ray request. The guy was just looking at me like I' m from another planet.''*

This attitude from the doctors is likely to impact negatively on the radiographers and consequently influences their attitudes and behaviours. This disrespectful attitude, according to another participant, may cause low self-esteem among radiographers. Similarly, consequences that may emanate from such situations, according to Minisini *et al* (2011:5) is a tendency by individual health practitioners, in this case radiographers, to believe that they lack skills and attributes which in turn lead to issues of competency. On the other hand the above comment by the participant is a clear demonstration of dominance of the medical profession over other health professions as evidenced in literature (Lewis *et al* 2008:90).

On the issue of dominance by medical professionals, participants felt that the issue

was more of who has power than the interest of patient care. In order to avoid the perceived dominance one participant had this to say:

> *''But I think it is also our responsibility to respect and support others. What I mean here is how we approach or respond to other health professions' questions or requests.''*

The views by the participants were that a positive attitude and interpersonal relations in the context of rural radiographers require that one becomes responsive to the other health care workers' questions and concerns. According to the participants, respect, positive attitude and good behaviours by rural radiographers may help other health care professionals to harness different member competencies available to provide comprehensive healthcare services to the community. The majority of participants bemoaned that most of these attributes were missing in their training. This however is in contrast with Van der Horst and McDonald (2001:24) who argue that instilling the right attitude and values form part of the outcome based education.

4.2.3.3.2 Subcategory: Showing respect and having patience for rural patients' cultural beliefs

In this subcategory, the participants noted that the majority of rural patients are not as informed about x-rays as their counterparts in urban areas. The views of the interviewees, in this regard, were that rural radiographers must exercise patience when dealing with their patients. Furthermore, the participants were of the opinion that a caring attitude and showing compassion towards rural patients was an important attribute.

> *''It is important for us rural radiographers to exercise patience when dealing with patients because most of them do not know what x-ray is all about.''*

The observations of the respondents appear to reaffirm the results of a study that was conducted in rural KZN on factors influencing patients demand for x-ray examinations which found that only 10.9% out of 110 rural patients who were surveyed had good knowledge about x-rays (Mung'omba & Botha 2012:18). But it also brings out one of the characteristics that may be required by rural radiographers, namely a respectful attitude towards these patients. Similarly, Hoge *et al* (2005:518)

is of the view that attitudes, values, traits and behaviours are characteristics which could influence and may be required for effective performance.

Another participant explained that rural radiographers should also exercise patience with respect to cultural beliefs and in doing so build a good relationship. This view regarding respect for the patient's cultural beliefs is similar to the HPCSA's (2013:9) suggestion that factors such as culture, ethnicity, socio-economic status and spiritual beliefs must be considered when dealing with a given community. Other authors have observed that the absence of respect is a hindrance to good communication between health professionals and patients (Chris 2004:44).

4.2.3.4 Category: Communication in rural radiographic practice

The participants identified communication as an essential attribute for rural radiographers. Two subcategories that emerged from this category are discussed below.

4.2.3.4.1 Subcategory: Communication between radiographers and rural patients

There was a general agreement among the participants that the ability to communicate effectively was an important skill, especially for rural radiographers. This is because the majority of patients they serve are often not well educated. Some participants felt that even though rural patients may not be educated to converse there are other avenues one can use to communicate with them such as non-verbal. Below are some of the expressions from the participants:

> *''…we need to communicate to our patients a bit different. What I mean is that we need to come down to their level of education and be able to explain in a simple language which they can understand.''*

The opinions above affirm the importance of effective communication between a rural radiographer and a patient. However, the ability to adjust and be able to communicate in a simple language that a rural patient with no education can understand may not have been covered during training. This finding was also evident in a study conducted in Australia where it was found that doctors should be equipped

with effective communication skills as a desired attribute for practicing in rural communities (Woolley *et al* 2013:93). Proper communication allows the patient to understand the instructions and what is required of him or her during and after the x-ray examination. Moreover, it has been found that patient satisfaction and adherence to health care instructions is linked to better health worker-patient communication (Tongue *et al* 2005:652).

4.2.3.4.2 Subcategory: Communication between radiographers and other health professionals

The data reveals that most focus group participants felt that effective communication was vital not only between a radiographer and the patient but also the referring physicians and other healthcare professionals. However, many of the participants were of the opinion that health professionals in rural areas, especially doctors, do not care how they communicate with radiographers.

> *''…they should humble themselves and say you know what I also need your help. Let's communicate.''*

The problem of communication by the doctors was also noted in the Australian study in which it was revealed that without equipping medical graduates with effective communication skills, issues of equity was likely to continue (Woolley *et al* 2013:93). The problem of communication between radiographers and other health professionals especially doctors is further compounded by the fact that during training radiographers do not mix with doctors a lot. In tertiary hospitals where radiographers do their practical, most of the communication directed to the radiology department by doctors is handled by radiologists.

On the other hand, one of the participants came to the defense of rural doctors. The participant argued that this was not the case with many doctors at her hospital. This view is reflected in the following comment:

> *''But some doctors come to ask if they are not sure.''*

The participant further described that at her hospital doctors do communicate with

radiographers when need arise. This view by the participant is shared by Alali and Jinadu (2002:81) who noted that good communication between health professionals play an important role such as guiding effective health care. It is however imperative that the radiographer should be properly trained so that whenever they are approached they are able to respond in a manner that builds up interprofessional collaboration. In rural areas where patients ask radiographers' opinions on the x-ray results it is imperative that a radiographer does not give a different opinion to the one that the patient may gate from the referring doctor.

4.2.3.5 Category: Outreach programme

The focus group interviews revealed that whenever outreach services are mentioned in the rural context, diagnostic imaging is the only discipline among the allied health professions that is not included. Outreach services in the allied or clinical support cluster are associated with disciplines such as disability and rehabilitation, dietetics, dental services, pharmacy and optometry. The views and opinions of the participants in this category were that radiography too can play a role in the outreach programme. Below are the two subcategories that were identified in this regard.

4.2.3.5.1 Subcategory: Introducing outreach programme for the diagnostic imaging

Transcribed data revealed that members of the focus group were of the view that radiographers should take the services of diagnostic imaging to the community just like other allied professionals do. This is what one participant said with regard to introducing outreach services:

> *''...we should also be doing outreach programmes like other professionals such physio, dieticians, Occupational therapists speech therapists, dental therapist.*

Nonetheless, other participants disagreed with this suggestion. One of them said it was not possible to go and do x-rays in the PHC clinics.

> *''We can't take our x-ray equipment to the clinic.''*

In response, the proponent for the introduction of outreach services said he did not

mean taking the x-ray machine but a portable ultrasound machine. He reminded other members of the focus group that they do a lot of basic obstetric ultrasound scans even though they were diagnostic radiographers. And it was mentioned that many of these patients who come for obstetric scans come from PHC clinics.

''We can take this service nearer to where the patients stay.''

The participants' comment is supported by one author who wrote that the adoption of PHC as means of delivering health needs to all South African citizens meant that radiological services were required to be at all levels of healthcare (Thulo 2006:3). PHC system calls for, among other things, a shift from the legacy of curative and hospital centric approach. Unfortunately, this is the approach where most South African health professionals and health consumers alike have been socialized (Dhlomo 2015).

The debate among the participants regarding PHC services reveals lack of knowledge by participants about the healthcare system. It shows that rural radiographer's still brings with them the culture of tertiary health care where they are exposed during training into the PHC set up. Contrary to this view, these findings suggest that some radiographers are willing to move out of the confines of the x-ray departments and take the services closer to the community. This then brings to the fore that there was need to expand the scope of radiography practice so as to accommodate additional skills and competencies that may be required for such undertakings, for example limited sonography skills. Moreover, evidence from published literature suggests that in order to respond to the epidemiological and demographic transition of the rural population there was need for adjustment and change for health professionals working in rural areas (Duckett 2005:201).

4.2.3.5.2 Subcategory: Health information

In this subcategory, the interviewees expressed opinions that the outreach programme can also be used to disseminate information to the patients about radiography. Several participants were keen to reaffirm that not only was the outreach programme essential for providing basic obstetric ultrasound but also health information about x-ray radiation.

''May be we can give health education to these communities about x-rays during outreach visits.''

It also emerged that the radiographers can use this forum to make themselves known to the communities and what exactly they do. According to one participant this could be an opportunity for radiographers to educate the community that radiographers do a variety of examinations and not just chest x-ray and bones as the community has to believe. Literature suggests that the ability to think and act are characteristics of a well-trained graduate (Bell *et al* 2010:31).

4.2.3.6 Category: Differences between rural and urban radiographic practice

Throughout the focus group session there was a unanimous agreement among the participants that the practice of radiography in rural hospitals was different from that of major urban hospitals**.** Under this category there were four subcategories which emerged and are discussed below.

4.2.3.6.1 Subcategory: No modern equipment

The analysis of transcribed data showed that rural hospitals do not keep up with the technological advancement in radiography equipment as compared to urban hospitals. The participants noted that x-ray equipment in rural hospitals was old. Below are some of what participants had to say:

''What is the use of studying CT in Durban and come here and do just x-ray.'' ''...you end up being rusted not knowing how to do a CT scan...''

The issues of differences in the type of equipment between rural and urban as identified by the interviewees have also been identified in other studies. For instance, a study conducted in South Africa by Thulo (2006:1) noted that there was a difference in the rate of advancement of radiography technology between private and public hospitals. This is even more prevalent in rural hospitals. The participants wondered whether these differences could be attributed to, among other factors, service levels of the rural hospitals and the remoteness of these hospitals. During pre-service training radiographers are only exposed to modern equipment. Once posted

to rural hospitals they find it difficult to work because majority of these rural hospitals were still using old equipment.

4.2.3.6.2 Subcategory: Doctors seeking the opinion of radiographers on x-ray images

The essence of this subcategory was a discussion by participants about how rural doctors seek the opinion of radiographers on x-ray images. The participants disclosed that since there were no radiologists in rural hospitals most doctors seek the opinion of radiographers on x-ray films. The participants mentioned that doctors do not take into account the experience of the radiographer. This is not the case in large urban hospitals where they have radiologists. Data supporting this subcategory is:

> *"...doctors come to ask for instance if I have seen any fracture on the film I have just produced.''*

> ''*In rural hospitals we end up becoming 'radiologists'. Doctors always come to us asking what we think about the x-ray. In fact it is not only the doctors who ask. The patients also ask, what do you see on the x-ray? Is something wrong or do I have TB?''*

These findings are consistent with the results of the study conducted by Smith *et al.* (2009:2) which also revealed that doctors in rural hospitals of Australia actively seek and value the opinion of radiographers on the radiographs. Even though radiographers are approached by doctors on this matter they are not equipped to handle such requests. In fact they are not allowed either by law or training (Smith *et al* 2009:1). But this is an additional competency that may be required by rural radiographers and it was likely to benefit both clinicians and rural patients in particular.

One participant said that radiographers find themselves in the dilemma when the patient asks for their opinion because there is no provision in the scope of practice. This observation by a participant is supported by evidence from literature which indicates that persistence of rural patients on wanting to know what the x-ray shows puts radiographers in a dilemma on whether to give the opinion, and if so, how to phrase it (Squib, *et al* 2015:26). Moreover, the role of radiographers in this context,

according to the same authors, is not clear and may have particular implications for those working in rural areas. In the South African context, however, radiographers are only allowed to discuss the results of the x-ray image with the referring clinician (Gqweta 2012:22). On the contrary, radiographers in some countries are not allowed to interpret and report on x-ray images at all (Smith *et al* 2009:1).

4.2.3.6.3 Subcategory: Routine or boring work as part of rural.

Participants observed that rural radiographic practice is boring in the sense that much of it is routine work. This according to the focus group is another area that makes rural radiographic practice to be different from the urban practice. One participant even mentioned that the work was not challenging.

> *''....it is one and same thing now and then.''*

Many participants explained that every morning when they report to work they know that they will mostly be doing chest x-ray examinations unlike in big urban hospitals where one has a variety of x-ray examinations. Participants felt that this difference may demotivate radiographers working in rural hospitals and hence have a negative impact on their long term stay in rural areas.

4.2.3.6.4 Subcategory: No specialists in rural hospitals

The absence of specialists, such as radiologists, in rural hospitals was another contrasting area that the participants identified. The issue of rural radiographers working without the support of radiologists is well documented in literature (Munro, Isaacs, Friedrich-Nel & Swindon 2012:31). The participants' views and opinions in this regard were that this kind of situation has an impact on how they carry on with their imaging activities.

> *''You go to rural hospitals you are asked to do a barium swallow or barium meal on general x-ray equipment instead of fluoroscope. In tertiary hospitals these are done together with radiologists.''*

> *''....when there is a trauma patient and you need to do four views but you will be wasting your time…..... no one will be reading your x-rays because they are all used to AP and lateral views only.''*

The opinion and the views expressed by participants are supported by Pratt (2005:12) who argue that if specialists such as radiologists were present during patients examinations they may decide on further views or other actions. The absence of support from radiologists is bound to cause rural radiographers to have low self-image and poor belief in their own abilities (Minisini *et al* 2011:5). This assertion is supported by one participant who said that by not doing different x-ray projections as may be required if the radiologist was present makes her look like she doesn't know her job. The views and opinions of participants suggest that radiographers in rural areas tend to negate the core professional identity which in the case of radiographers is to produce quality image which by extension reflect their patient care. Thus, radiographers in rural areas no-longer care about the quality of the images they produce because these images will not be judged by the critical eye of the radiologists (Smith 2007:273).

4.2.3.7 Category: Challenges encountered by radiographers practicing in rural KZN

The category ''challenges encountered by radiographers practicing in rural KZN'' describes the participants' views and opinions on the challenges that they face in the execution of radiographic duties in rural areas. Just like challenges identified in in literature, participants in Phase I of this study also identified a number of challenges which they said impact on their ability to practice rural radiography competently. The issues which interviewees identified as challenges or difficulties were grouped into five subcategories. These subcategories are discussed below.

4.2.3.7.1 Subcategory: Lack of appropriate competencies

The interviews revealed that participants encountered a wide range of challenges in the practice of rural radiography. To these effect participants identified some of the competency areas that they thought were lacking in the pre-service training. These include, financial management, human resource management, leadership, communication skills, basic ultrasound scanning and many more.

''…the topics like budget control and expenditure we don't understand but

they expect us to be part of these meetings.''

''I don't remember us covering financial issues in our training.''

''I feel we still need more training because there is a lot of work in rural than in urban.''

As reflected in the participant's comments above, many of them did concede that there were some things that they were required to do but were unsure of how to go about. Supportive literature shows that rural health services have faced challenges which include a lack of appropriate competencies (Lloyd *et al* (2010:172). For instance, one participant pointed out that communication skills were a challenge especially when it comes to communicating with rural patients and he placed the blame on the radiography training institution for not equipping him appropriately. It is evident from participant's comments that rural radiographers are faced with challenges which are not necessarily radiography aligned. Accordingly, Reid (2006:677) was also of the view that the challenges that are faced by rural health care professionals require specific and wide-ranging skills.

4.2.3.7.2 Subcategory: Lack of proper staff orientation

Lack of proper orientation for both rural radiographers and other health professionals including doctors was identified from the interviews as one the challenges that many rural health professionals face.

''....if they are oriented they will know what type of machines and its' capabilities. Get an orientation of like this is the X-ray department, we have so-and-so as radiographers, we have these kind of machines, maybe they will know what to order, and not order.''

The participants' views and opinions were that lack of proper orientation when one is appointed to the rural hospital is a challenge. They said that radiographers together with the doctors need go through a well-planned orientation seminar where all essential units of the hospital do presentations on what they do and what is expected from the new staff. This was said that it should be a programme that is done each time hospitals have new recruits. Participants noted that such undertaking was bound to expedite integration of new staff in particular radiographers.

4.2.3.7.3 Subcategory: Outdated x-ray equipment

In the subcategory 'outdated x-ray equipment' participants revealed that there were differences in the complexity and sophistication of equipment they use during training at tertiary hospitals and the equipment found in rural hospitals. Currently, almost all rural hospitals are still using conventional radiographic film. The interviewees revealed that because of the outdated equipment being used in rural hospitals, radiographers were unable to give a wide range of diagnostic services.

> *''...we don't have enough equipment to practice what we know.''*

The participants' views and opinions are congruent with Thulos' (2006:1) contention that there was a difference in the rate of advancement of radiography technology between private and public hospitals. The issue of old equipment is even more prevalent in rural hospitals where it is still being used. One participant added that this was more than just a challenge, as it directly impact on the quality of health care services that is rendered to the rural patients.

> *''...I want to help my community....I know things that they need...but I can't ... no latest equipment.''*

The evidence from literature also confirms that appropriately placed technology contributes toward the enhancement of quality healthcare service delivery (Yadin & Jahnke 2004:73).

4.2.3.7.4 Subcategory: Lack of appreciation for radiographer's role

Participants identified a lack of appreciation in rural areas as one of the challenges encountered by radiographers in rural hospitals. It was noted that this was very common with doctors with whom radiographers work closely. The participants said that they expected a gesture of appreciation from the doctors more than any other health professionals. Some of the participant's quotes in this regards were as follows:

> *''.....you try and do things right but the feedback that you get is not nice and you feel like you are useless.''*

''I think the other thing that is lacking in rural radiography is appreciation from the doctors when you are doing the right thing, they don't come to you and say thank you.''

The above comments are supported by published evidence which suggest that the profession of radiography has been a subject of subordination and limitation from other healthcare professions such as medicine (Smith 2006:7). One participant felt that other rural health professions do not know how much effort rural radiographers put considering that the equipment is old. Supportive literature report that unless one has been exposed and worked in both urban and rural context, understanding and appreciating the vital role those rural radiographers play might be difficult (McNinch 2004:4).

4.2.3.7.5 Subcategory: Need for representation of radiography in broader management

Another challenge that emerged from the interviews with the focus group participants was a lack of representation of radiographers at senior levels. Lack of representation at senior levels appears to affect the effectiveness of rural radiographers as reflected in one participant's comment below:

''...can make us more effective having representation at all levels I mean at the hospital, district and head office.''

The participants felt that some of the challenges they face in rural areas may be linked to lack of representation at high levels. It was mentioned that considering the environment in which rural radiographers work, representation in the broad management may help to advance their needs and challenges. One participant mentioned that lack of representation at broader management level was not the case with other allied professionals such as pharmacists, physiotherapists and dieticians.

The views and opinions of the participants on this matter came out strongly in favour of having someone of their own representing radiographer's interest at higher levels. An example of data in this regard was:

''I we had a representative in these levels is the one who is supposed to be consulted…''

It was mentioned that issues and other related radiographic concerns that affect radiographers and the practice in general can be directed to such a person. According to the participants this representative will be able to appreciate and understand the issues better because of his or her radiographic background.

4.2.4 Theme 2: Radiography training and rural practice

In theme 2, namely radiography training and rural practice, there were two categories and eight subcategories that were identified and these are reflected in Table 4.3 below.

Table 4.3 Theme 2: Radiography training and rural practice

Theme	Category	Subcategory
Theme 2: Radiography training and rural practice	Rural radiography practice	▪ Appropriateness of curriculum for rural radiography ▪ Darkroom techniques ▪ Need for short courses
	Scope of radiography and rural practice.	▪ Clinical assessment of injured part ▪ Basic ultrasound scanning ▪ Rural radiographers doing ECG ▪ Problem solving ▪ Rural radiography and leadership skills ▪ Rural radiography and management skills ▪ Rural radiographers' managers work like generalist.

4.2.4.1 Category: Rural radiography practice

The views and perceptions of the focus group members were that rural radiography practice appears to be broad and encompass competencies that may not have been obtained at the point of graduation. This broadness of the rural radiographic practice however hold true for other rural healthcare professionals such as doctors, nurses, physiotherapists or dieticians (Strasser & Neusy 2010:777).

4.2.4.1.1 Subcategory: Appropriateness of curriculum for rural radiography

The views and opinions that emerged from the interviews revealed that the current radiography training does not fully reflect the rural requirements in terms of radiography practice. It emerged from the focus group interview that the radiography curriculum used at the time of the study appear not be aligned to the needs of rural radiographic practice. This argument is evident in some of the participant's comments below:

> *''... this goes down to our training and curriculum. Its like the curriculum is not aligned to the needs of rural hospitals. So the curriculum and the actual job or workplace is totally different.''*

These findings of a curriculum not encompassing competencies that reflect the actual practicing environment has been addressed in the literature. According to Baird (2008:e9) the educators need to place the practice of radiography at the center of the curriculum to ensure that the course content is contextualized to the needs of the practice setting. The participants' views and opinions are that there is no link between the radiography curriculum and the competencies needed for rural practice. This, then, gives credence to Hoge *et al* (2005:511) who argue that lack of competencies to effectively practice radiography in rural setting may no longer be blamed on individual radiographers alone but on the training institutions as well as the system of care. While on the other hand other authors have suggested that it is essential that knowledge, skills and attitude relevant to rural practice are included in the curriculum (Reid & Cakwe 2011:37). To this effect, Castleman (2007:65) is of the view that training institutions have the responsibility to ensure that their former graduates are supported for the purpose of lifelong learning.

4.2.4.1.2 Subcategory: Darkroom technique

In this subcategory the participants revealed that rural hospitals are still using analogue equipment that includes processing of films in the darkroom. It was also disclosed that it was the responsibility of radiographers to ensure that all equipment in the darkroom which includes the film processing machines, were maintained and kept in good operational condition at all times. However, some of the participants

said they were not trained in the darkroom technique and as such they find it difficult to work well.

> *''.....I didn't know that I will become a darkroom operator because in urban areas there are people who are supposed to do that job…'' When I came to rural areas I was expected to change chemicals, clean the processor, clean the rollers, know when it faulty…''*

> *''....I was not taught how to clean the film processor machine.'' For me I think the training was not adequate for me to be able to discharge my duties effectively in rural hospital.''*

The above comments by participants are however in contrast with a study conducted in South Africa by Davidson (2006:139) which concluded that maintaining a film processor, for instance cleaning and replenishing of a wet processor was a core competency required by a graduate radiographer. On the other hand, the participants' views appear to support Anema and McCoy (2010:2) who argue that completion of education appears not to prepare these radiographers for workplace, which means they do not have adequate skills to make them competent at their jobs especially with regard to rural work.

4.2.4.1.3 Subcategory: Need for short courses

The interviewees were of the opinion that rural radiographers may be supported by supplementing their core skills and knowledge obtained during training by offering them short courses or in-service training. Others were of the opinion that the current curriculum can be adjusted to accommodate the needs of rural radiography practice. One of the participants made the following suggestion:

> *''...training institutions need to introduce rotation of students to rural areas during their practical training not just doing it in these big well equipped tertiary hospitals but to let students have a feel of what rural radiography is all.''*

The above suggestion by the participant to mitigate the shortfall in the training goes even further than the proposal made by Tan-Liang *et al* (2010:12) which advocates for the use of radiographic technique simulation within the tertiary hospitals. Similarly a study on psychologists working in rural Australia revealed that rural

placement of students during training was one good way of preparing students for rural work (Sutherland & Chur-Hansen 2014:275). The participants' views reinforce the need for equipping rural radiographers with competencies that may enable them to practice rural radiography. This view is also reflected in the memorandum with reference number HRM 93/3 which the then KZN health general manager for clinical support services issued to the department's Human Resource Management Services (HRMS). In this circular, the general manager for clinical support services recommended that there was need for a comprehensively trained radiographer with additional skilling of the current radiographers already in the system (Simelane 2013).

4.2.4.2 Category: Scope of radiography in rural practice

In this category participants shared the experiences regarding the extra responsibilities which they are requested to undertake in rural hospitals other than their core radiographic duties. They all agreed that some of these responsibilities were not in the scope of radiography and as such were not covered during training. It also emerged during the interviews that some of these duties extend beyond the confines of their x-ray departments and they includes activities such as leadership, management, cash-flow meetings, planning, problem solving and so on and so forth. The broadness of work for rural radiographers is not peculiar to radiographers only but also to other rural health professionals.

4.2.4.2.1 Subcategory: Clinical assessment of the affected part

Clinical assessment of patients' affected part by rural radiographers was identified as a need by the focus group. The interviews with the focus group revealed that rural radiographers work with doctors who, many among them, are less experienced and as such they send patients for x-ray examinations unnecessary.

> *''These doctors request x-ray examination for anything. Sometimes without proper clinical assessment.''*

Another participant explained that it was the responsibility of the radiographer to ask the patient before doing the x-ray examination:

''...but you have to ask the patient what happened, did you fail? Where is the pain?''

Supporting the above comment, another participant described her experience with one patient who was referred to her for x-ray examination.

''Yes. That is true. There was a patient who was involved in an accident and he was sent for x-ray examination. They requested pelvis, chest x-ray, cervical, thoracic and lumbar spine and her right forearm. The patient came to the department walking and she was carrying her bag which appeared heavy with the same injured forearm. But I saw that the forearm was not swollen and when I asked the patient she said she had no problem with the arm.''

The above description from a participant reaffirms the earlier view by another participant that a radiographer needs to assess the affected area that needs to be x-rayed if in doubt. These results were found to be consistent with a study conducted by Snaith and Lancaster (2008:151) which found that radiographers have even gone further by asking patients about clinical history and even doing limited examinations of the affected area even though this was not part of their traditional scope of practice.

4.2.4.2.2 Subcategory: Basic ultrasound scanning

Nearly all the focus group participants identified the ability to do basic ultrasound scanning as a necessary additional competency that a rural radiographer should possess. However, the focus group interviews revealed that ultrasound scanning does not fall under the scope of diagnostic radiography but often rural radiographers are requested to do scans. Radiographers are requested to scan even though they do not have the appropriate skills. One participant said;

''We come to rural hospitals where there are no sonographers we are expected to do basic obstetric ultrasound scans.''

Another participant added that at their hospital radiographers do not only do basic obstetric ultrasound scans but also basic abdominal and gynecological scans.

''Actually its not only obstetric ultrasound its gynea and abdomen. Doctors send patients to us to rule out abdominal TB. ...we need recognised training in this skill.''

The comments by the participants are a sign that the ability to do basic routine obstetric and abdominal ultrasound scans is an important additional competency that rural radiographers should have as this will help them play a role in the management of patients. Evidence, from literature suggest that ultrasound, in the absence of MRI and CT, becomes an important diagnostic tool for TB of the abdomen in most HIV patients (Heller *et al* 2010:e110). The views and opinions expressed by participants are also an indication that rural radiographers acknowledge their limitations in the identified competency area. It is thus important to identify required additional competencies and improving on those that need to be improved.

With regard to possessing the skill to perform ultrasound scans, the participants further suggested that they can even introduce outreach programmes as a way of taking ultrasound services, especially routine obstetric ultrasound, closer to the community.

''...we are in PHC so we can take this service nearer to where patients stay. We can use portable ultrasound machines.''

Responding to the above opinion another participant commented;

''...we need to be given proper training in this area.''

The above expression is in line with published evidence which show that extra responsibilities inherently increase the need for multi-skilling of radiographers working in rural areas so as to improve their capabilities to meet the needs of the rural communities (Hardy *et al* 2010:29). Similarly, this was also the views of the participants that they need to be capacitated through training to enable them to perform these non-traditional radiography duties. Evidence from published literature suggests that radiographers' value skills mix as an opportunity to expand their knowledge (Lumsden & Cosson 2015:61). In the same vein the results of the study conducted by HPCSA's Radiography Board (2014) showed that 64% of the respondents were of the opinion that a short but accredited certificate course in image interpretation should be offered to diagnostic radiographers.

4.2.4.2.3 Subcategory: Rural radiographers doing ECG

It was also revealed that rural radiographers go beyond the scope of radiography. Participants mentioned that they are asked to perform various tasks despite the fact that they were not trained in those areas. This is what some participants said in this regard;

> *''…in other hospitals the radiographers are still doing ECG even though it is totally out their scope of practice…I was the one doing it and I didn't even know what it is, even if it's wrong or right…''*

Another member of the focus group agreed with his colleague and added that at his hospital they will ask radiographers to undertake responsibilities that they never trained for.

> *''….they wanted me to do something that I have never even done and even studied.''*

It was the view of the focus group participants that generally the scope of practice of radiography and guidelines that govern the practice of diagnostic radiography are not respected let alone recognised by rural health authorities. The participants felt that this may have negative implications on the overall healthcare delivery. It was also mentioned that rural patients are likely to receive 'below par' healthcare service as a result of radiographers doing such duties without being properly trained.

4.2.4.2.4 Subcategory: Rural radiography and leadership skills

Data revealed that rural radiographers are expected to provide leadership to their respective x-ray units. Participants agreed that good leadership was important if one was to meet the objectives of the x-ray department but they also bemoaned the limitation in their abilities in this area. To this effect, some of the participants were critical of the fact that they are given these responsibilities despite the limitation in their knowledge, skills and experience.

> *''I was not trained in HR but I'm expected to handle issues such as disciplinary procedures since I'm a supervisor.''*

The view expressed by one of the participants above is a reflection that even though leadership is important, rural radiographers are not properly equipped to undertake such responsibilities. The participants further agreed that specific knowledge and skills were required to ensure adequate leadership of x-ray units in rural hospitals. The focus group members further acknowledged that there was a gap in the competencies required. This is supported by published literature which show that obtaining leadership competencies for the clinical setting is not necessarily part of the radiographers' training (Oslen & Neale 2005:1219).

However, the results in this subcategory are in contrast with other studies that focused on other health professions like the nurses where it was found that a great deal has been done in identifying leadership and management competencies (Cameron *et al* 2012:1469; Jasper & Crossan 2012:838).

4.2.4.2.5 Subcategory: Rural radiography and management skills

As described in the literature review in Chapter 2, radiographers working in rural district hospitals are required to provide effective management in the absence of radiologists. Management competency at x-ray unit level demonstrates the degree, to which a supervisor develops unit plans, assigns duties to the supervisees, and promotes teamwork and more. Yet, data illustrate that the type of management that rural radiographers are expected to undertake may not have been part of the radiography training curriculum. This was highlighted in the comments by some of the participants:

> *''...Management is not part of our training and yet we are expected to manage. Yes, other things like radiation, equipment we were properly trained.''*

These views by participants are an indication that the practice of rural radiography extends beyond the confines of traditional radiographic imaging and involves other skills such as management. It is not just being equipped with functional competency only but one needs also to have generic competencies which appear not be the case as reflected in the comments above. Eygelaar and Stellenberg (2012) reported similar findings that even though rural radiographers play multi roles, they are often

inadequately prepared for some of these tasks.

4.2.4.2.6 Rural radiographers' managers work like generalist.

In this subcategory the focus group members, especially those in higher ranks, noted that they are unable to perform the duties of leadership and management efficiently because there are too many other duties. They mentioned that the radiography manager or chief radiographer is also expected to perform clinical duties.

> *''... in rural hospitals you do manage x-ray staff...attend hospital meetings. There is just too much for radiography managers or supervisors in rural hospitals.''*

One chief radiographer disclosed that she is expected to attend to patients and also go for meetings. The participants felt that other than just managing the x-ray units, radiography managers or supervisors are expected to perform clinical duties also. This finding is supported by literature which attest that rural radiographers are faced with expanded skills mix which in many cases is not recognised (Cowling, 2013:91). On the contrary, these findings are however different from the UK where a 'four-tier' model has been implemented. In this model, according to Woodford (2006:320), the most senior level is for a consultant radiographer whose duties are purely management.

4.2.5 Theme 3: Views of rural radiographers on CPD as lifelong learning concept.

The theme 'views of rural radiographers regarding CPD as a lifelong learning concept' describes the experience of radiographers working in rural areas in relation with CPD. During data analysis two categories and five subcategories emerged under this theme. These are represented in table 4.4 below.

Table 4.4. Theme 3: Views of rural radiographers on CPD as lifelong learning concept.

Theme	Category	Subcategory
Theme 3: Views of rural radiographers on CPD as lifelong learning concept.	CPD activities and rural radiography practice	▪ Relevance of CPD activities ▪ Localising CPD activities
	Barriers to CPD activities for rural radiography	▪ Accessibility of CPD seminars ▪ Attitude of rural radiographers towards CPD ▪ Lack of logistical support by hospitals

4.2.5.1 Category: CPD activities and rural radiography practice

Focus group members shared their views on CPD activities and rural radiography practices. They all had various reasons as to whether CPD activities were relevant to rural radiography and also whether it was worthy travelling such long distances to attend. Two subcategories emerged from the interviews. These are discussed below.

4.2.5.1.1 Subcategory: Relevance of CPD activities to rural radiography practice

It was the view of all the participants that the current CPD activities for radiographers do not take into account the needs of rural radiography practice. This is evident in the comments that came out from some of the participants during the interviews.

> *"I think those people who are involved in the CPD programing do not know what should be included in the CPD to cater for rural radiographers."*

This participant went on to give examples of what was discussed in one of the CPD seminars that he attended;

> *''.....they were talking about 64 slice CT, ultrasound guided procedures which we do not have or do in rural areas''*

Another participant added;

> *"....CPD activities are there only for radiographers to accumulate points. They discuss things like CT scans, mammography, MRI and radiotherapy which has nothing to do with rural radiographers."*

One participant felt that the irrelevance of CPD activities to rural radiography practice increases apathy and an 'I don't care' attitude towards CPD by radiographers working in rural hospitals. The participants also mentioned that they were not advocating for a total overhaul of the current CPD programme but rather inclusion of activities that are relevant to rural setting. Nevertheless, the comments suggest that those who may attend only do so for the sake of accumulating CPD points to fulfill statutory requirement.

4.2.5.1.2 Subcategory: Localising CPD activities

The focus group interview revealed that there was a desire by most of the participants to participate in the CPD activities that were biased towards rural radiography practice. The participants were of the opinion that it was more helpful if rural radiographers could organise CPD seminars or workshop that will have a rural touch.

> *''...I think it can be possible if we can have an insider training.''*

Supporting the proposal, one participant went even further to suggest that rural radiographers may team up and apply to HPCSA for approval to host CPD seminars.

> *''Maybe we can try to apply to HPCSA for approval and accreditation to have a monthly CPD meeting as rural radiographers.''*

Some participants were even looking beyond the application to HPCSA. They were even proposing how these meetings would be run.

> *''Yes in these meetings we can say.... Invite the doctor to come and do presentation on topics like 'the role of chest x-ray in TB management.' In this way we can get CPD points without going to cities and at the same time the topics will be tailored to our needs.''*

The idea that the participants put forward is supported by Hardy and Snaith (2006:329) who argue that extended competencies such as those required in rural practice can be gained through locally initiated practical based training, for example local workshops and in-house training. On the other hand, these results challenge Cooper's (2002:18) argument that rural health professional fail to undertake such opportunities, such as organising in-house CPD, due to lack of imagination, attitude or just lack of foresight to see value in such activities.

4.2.5.2 Barriers to CPD activities for rural radiographers

During data analysis three subcategories were identified under category 'barriers to CPD activities for rural radiographers.' The three subcategories are discussed in the following subsections.

4.2.5.2.1 Subcategory: Accessibility of CPD seminars

The participants unanimously identified physical distance where CPD activities are presented as a barrier to their participation in the CPD seminars. The interviews further revealed that participants are discouraged to engage in CPD activities because of distance.

> *''They always do them in Durban or Pietermaritzburg and we don't have time to go there.''*

The views and opinion expressed by the participant are similar to the results of a study conducted in Ghana by Gawugah *et al* (2011:333) which found that loss of interest by health professionals to attend CPD seminars may be linked to a place where CPD activities are presented. While other studies suggest that limited accessibility of CPD activities by rural health professionals may be linked to worker frustration (Kean *et al* 2012).

4.2.5.2.2 Subcategory: Attitude of rural radiographers towards CPD

The views and opinions of focus group participants suggest a negative attitude by rural radiographers towards CPD activities as reflected in the comment of one of the

participants below;

> *''....we just go for these CPD seminars to collect points, socialise and meet our old friends.''*

This finding is different from the results of the study done in Western Australia, on the attitude of radiographers, which showed that 69% of respondents acknowledged that CPD was essential for health practitioners to remain competent (Sholer *et al* 2011:21). One may argue that, this relatively narrow perspective of CPD by rural radiographers' defeats the very purpose of the CPD as a post-basic education aimed at updating knowledge and skills for health professionals and thereby enabling them to provide quality patient care (HPCSA 2010:1; Stagnitti *et al* 2005:355; Tame 2009:6;)

4.2.5.2.3 Subcategory: Lack of logistical support by the hospitals

Lack of support by the rural hospital authorities for radiographers to attend CPD seminars was identified by many focus group participants as a barrier. The focus group was of the view that they have reached a 'dead end' when it comes to participating in CPD activities, mainly due to a lack of support.

> *''...the medical manger will tell you that you are just going for CPD points so we are not going to give you transport.''*

In the same vein another participant had this to say

> *''I think they need to support us financially''*

The above comments from the participants reveal that rural radiographers face various challenges in an attempt to attend CPD workshops. Similarly, a study conducted by Kawooya (2012:4) found that rural health workers are likely to find it more difficult to access CPD such as seminars or other academic gatherings. Lack of support for radiographers to access CPD activities by rural hospital contradicts Hurme's (2007:9) view which argues that the hospital has the responsibility to foster competency among its employees including radiographers. Needless, to say participants had various opinions and perceptions, but also on how these impacts on their quest to maintain their interest on lifelong learning.

4.3 CONCLUSION

The results obtained through focus group interview are important because they show in depth views and opinions, in the rural radiographers' own words. The type of additional competencies, challenges, and other aspects of rural radiography as well as the ways in which these aspects influence their practice have also been highlighted by participants. In order to evaluate the extent of the focus groups' opinions and views there was need to go a step further and conduct a survey. The major themes and categories and subcategories that emerged from the analysis together with literature review were used towards the development of a survey questionnaire for Phase II of the study. The survey results could be used to reflect on the results of the focus group.

The next chapter deals with the quantitative data, results and analysis resulting from the survey questionnaire.

CHAPTER 5

DATA ANALYSIS, INTERPRETATION AND PRESENTATION OF FINDINGS OF PHASE II OF THE STUDY

5.1 INTRODUCTION

This chapter presents quantitative data analysis and interpretation. Data were obtained from a census sample of rural radiographers who completed a self-administered questionnaire. The themes that emerged from qualitative data analysis in Phase I informed the generation and development of the items in the questionnaire for Phase II of this exploratory sequential study. This then connects Phase II strand to Phase I strand, a procedure that Creswell and Clark Plano (2011:209) corroborate. For more information on the items in the questionnaire refer to subsection 5.2.2. Data entry and analysis were done using Microsoft Excel for Windows 2010 and the Epi-Info version 7.1.5 statistical software programme. Descriptive statistics namely frequencies, percentages and modes as well as inferential statistics two groups comparison t-test and one way analysis of variance (ANOVA) were used in the analysis. Results were presented in graphs and tables. The rationale to use visual forms in the presentation of results was to show trends and distribution of data, a view that is supported by Creswell and Clark Plano 2011:209). Percentages were rounded off to one decimal point and this resulted in percentages adding up to more than 100% or less (e.g 99.9 %.) in some cases. For questions to which not all respondents, especially community service radiographers, responded the frequencies and percentages were calculated based on the number of responses. This means that missing values were not included but were indicated in the tables particularly those tables presenting Likert items and open-ended questions.

5.2 DATA ANALYSIS

As was indicated in Chapter 3, literature identifies two types of data that may be generated from either Likert type items or Likert Scale. Each has its own unique data analysis procedure. In this study, the Likert scale data analysis procedure was used as suggested by Boone and Boone (2012). This means that sums or averages of the

responses on a group of Likert type items were summed up to give an overall score (Brown 2011:11). This, according to the same author allows for Likert Scale to be used as an interval scale. Similarly, Brown (2011:10) also reports that Likert items are frequently used and treated as interval scales in the field of the teaching language.

There were some questions to which not all respondents responded to. In such cases and for the purpose of this study, calculation of descriptive statistics (mode, frequencies and percentages) was based on the number of responses to a given question. This means that missing values were not included.

Analysis to find possible relationships between the demographic variables (gender, present post, present grade, qualifications, and experience) and each of the six constructs related to competency scales was done using two-group comparison t-test and one way analysis of variance. The level of significance used in the data analysis of relationship in this study was 5% (0.05). Only results that showed positive relationships were presented in the context of this study.

5.2.1 Questionnaire distribution and the response rate

The sample was selected using a census sampling method. This means that all radiographers working in the 34 Level 1 rural hospitals identified were included in the sample. At the time, a total of 135 radiographers worked in these hospitals and each received a questionnaire since it was a census sample.

Distribution and collection of the survey instrument took place between February 2015 and May 2015. During this period a total of 135 questionnaires were distributed. The questionnaire was distributed using two methods namely hand-delivery and postal. The use of more than one method in the distribution was done in an attempt to increase the response rate. There was a national wide postal service strike during the distribution of the questionnaire. It is assumed that some of those questionnaires that were posted did not reach the intended recipients. However, out of the 135 questionnaires distributed 113 of these were returned four of which were blank and thus not included in the analysis. This leaves 109 questionnaires representing a response rate of 80.7%. In a study where self –completion of a

questionnaire is used a 100% response rate is usually unlikely. However, considering that the survey response rate has been on the decline lately a response rate of 75% and above is considered acceptable (Bowling 2009:289).

5.2.2 Structured questions

For all items where Likert Scale items was used, the researcher used an even number namely, a four-point (1-strongly disagree to 4- strongly agree) Likert scale, deliberately skipping the neutral response. This was done in an attempt to reduce respondent's manipulation. For instance, some respondents may use the neutral response just to avoid indicating categories (responses/answer) that they may see as less acceptable (Johns 2010:7). Similarly, Clason and Dormody (1994:31) also noted that some researchers use an even number for response categories by omitting neutral response in order to avoid manipulation by respondents (Annexure VI). Other researchers such a Baggaley and Hull (1983:485) also used a rating scale with four response categories.

5.2.2.1 Section 1of the questionnaire

This part consisted of four items (1-4). These items solicited respondents' demographic information.

5.2.2.2 Section 2 of the questionnaire

There were 12 items, one of which was an open-ended question (question 15a and b). The other 10 items namely questions 5-14 were dichotomous, which means these questions had only two possible answers, e.g. ''Yes/No.'' These items are linked to qualitative data analysis in Phase I. The items dealt with issues related to the environment in which rural radiographers practice radiography. These issues are linked to Theme 1 with corresponding categories namely inappropriate use of x-rays, contrast between rural and urban practice and challenges encountered by radiographers practicing in rural KZN (Table 4.2).

5.2.2.3 Subsection 2.1 of the questionnaire

This subsection dealt with three constructs namely A, B, and C which emerged from Theme 1, under categories '*teamwork, attitude and behaviours and communication in rural radiography practice'* (Table 4.2) linked to qualitative data analysis. They were measured by 15 items (1 – 15). The other two constructs namely rural radiography and leadership, rural radiography and management emerged from Theme 2 under category '*Scope of radiography and rural practice'* linked to qualitative data analysis (Table 4.4). These two constructs were dealt with by 9 items (16 – 19 and 21 – 25). The other construct namely ethical practice, measured by items 26 – 28, was developed based on both literature review and results from Phase 1 qualitative data analysis. As indicated in Chapter 3, all six constructs related to competencies that may be required in rural radiographic practice were measured using a 4-point Likert scale.

5.2.2.4 Section 3 of the questionnaire

Items 29 – 33, using Likert scale measurement, dealt with the construct related to radiography training, career support and development. These items were developed based on Theme 2 under category '*rural radiography practice'* (Table 4.4) linked to qualitative data analysis. Seven items (35 – 41) with dichotomous responses namely 'Yes' or 'No' under this section also focused on rural radiographic practice.

5.2.2.5 Section 4 of the questionnaire

Likert Scale items 43 – 47 measuring construct A related to the role and meaning of CPD in rural radiography emerged from Theme 3 category '*CPD activities and rural radiography practice'* (Table 4.5) linked to qualitative data analysis. Dichotomous items (48-52) also emerged from Theme 3 but dealt with category '*Barriers to CPD activities for rural radiography'* (Table 4.5) linked to qualitative data analysis. The other items (53-56) were related to suggestions that maybe included in a CPD strategy proposal while item 57 requested respondents to indicate, on a pre-determined list, topics or competency areas of interest which they think may be included in future CPD activities.

5.2.3 Open-ended questions

Questions 15a and b under Section 2, question 20 under subsection 2.1, questions 34 and 42 under section 3a and b and questions 58 and 59 under section 4c were open-ended. These items of a semi-qualitative nature in the questionnaire were not coded for quantitative analysis because the researcher wanted to allow respondents to include all possible options. They were instead analysed separately and reported under the applicable section. In order to present it as quantitative data, the researcher grouped participants' responses in categories addressing similar issues and reported them as frequencies and percentages.

5.3 RESPONDENT'S BIOGRAPHICAL CHARACTERISTICS

Section 1 of the questionnaire comprised four items which were set to describe the demographic characteristics of the respondents. These were included in the study to determine whether there was any relationship between respondents' demographics and their responses. The demographic variables discussed in this section include; gender, post, grade, position (rank), qualifications and work experience.

5.3.1 Section 1 Item 1: Respondents' gender

The first question requested respondents to indicate their gender. Figure 5.1 represents the gender distribution of the sample of rural radiographers who took part in the second phase of the study

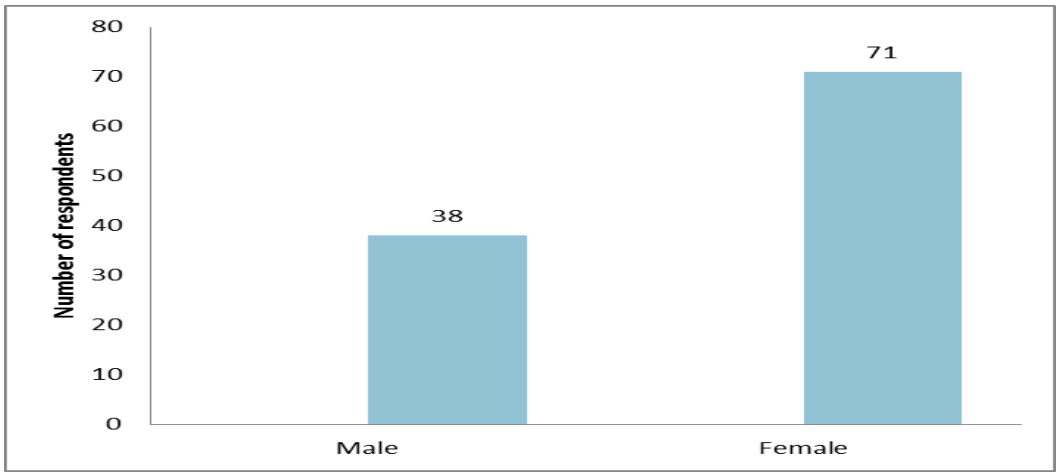


Figure 5.1 Respondents' gender (n=109)

The study sample comprised of more females than males representing 65.1% (n=71) and 34.9% (n=38) of the sample respectively. This is in line with the current demographics of radiographic workforce in the KwaZulu-Natal provincial department of health (www.kznhealth.gov.za).

5.3.2 Section 1, Item 2: Respondents' rank

The second item in section 1 of the survey questionnaire requested the respondents to indicate their current rank and grade by ticking the applicable rank. For the purposes of data analysis the respondents rank and grades were coded separately. Figure 5.2 shows ranks of the respondents

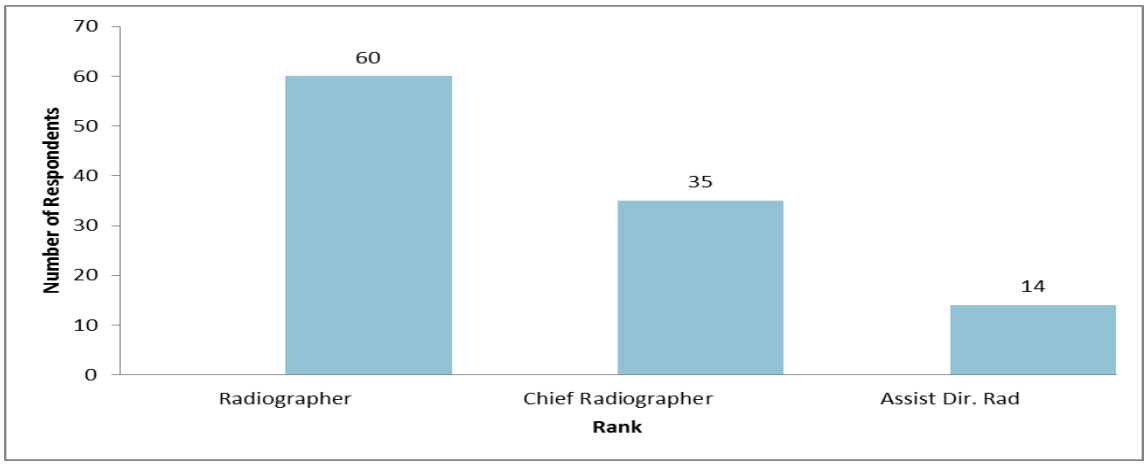


Figure 5.2 Respondents' rank (n=109)

According to Figure 5.2 more than half of the respondents 55.1% (n=60) were entry level radiographers while those with a chief radiographers' post accounted for 32.1% (n=35). Of the 109 respondents, only 12.8% (n=14) held the post of assistant director: radiography. The low number of senior level radiographers in the rural areas supports the assertion made in the literature review that many hospitals do not have posts for assistant director radiographer (ADR). Some of the duties for an ADR include coordinating and directing, leadership and management, representing radiographers' interest at hospital forum and many more. With fewer ADRs these duties are left to the chief radiographer. This however may have implications on the leadership and management of radiography as the Chief radiographers may not be adequately prepared for these duties (Eygelaar & Stellenberg 2012).

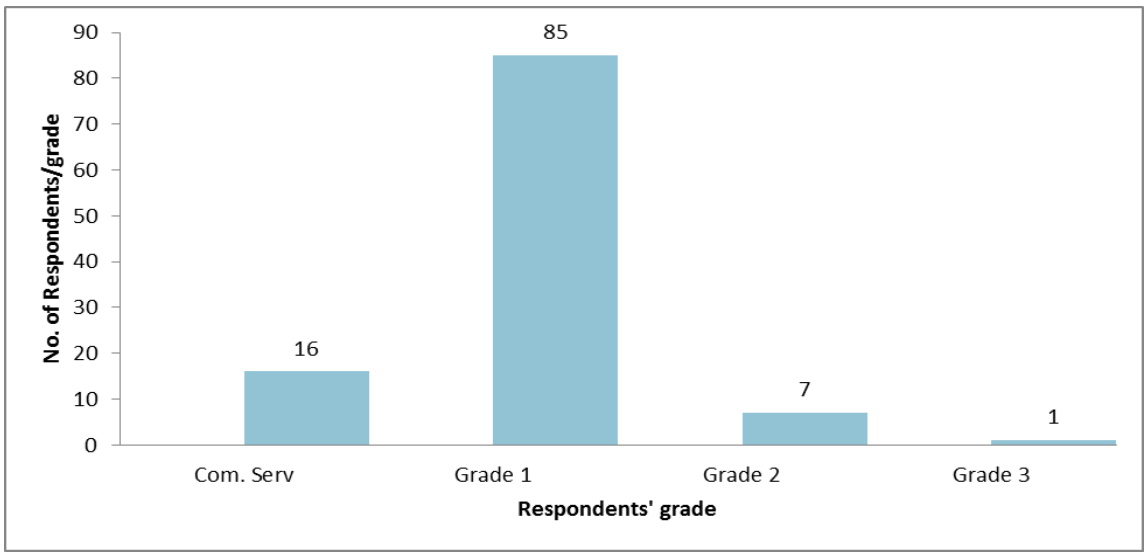


Figure 5.3 Respondent's rank grade

Figure 5.3 shows that the majority of ranks of the respondents 78.0% (n=85) were entry grade namely grade 1 in their respective posts. Out of 109 respondents, 14.7% (n=16) were community service radiographers. There were only seven respondents with a Grade 2 rank and only one (1) with a Grade 3 rank representing 6.4% and 0.9% of the respondents respectively.

The grades are related to years of experience after community service. For example a Grade 2 radiographer will have a minimum of 10 years of work experience and 20 years' experience for a Grade 3 radiographer. A comparison with other allied professionals such as the pharmacist reveals that they have a shorter period to ascend to a senior grade. For instance, a Grade 2 pharmacist will only require 5 years work experiences while a Grade 3 needs just 13 years of experience. It must be mentioned that grade progression for radiographers had not yet been effected at the time of the survey.

5.3.3 Section 1 Item 3: Respondents' highest qualification

Item 3 in section 1 of the questionnaire requested respondents to indicate their highest qualification at the time of the present study. Figure 5.4 shows respondents' professional profile focusing on the highest qualification.

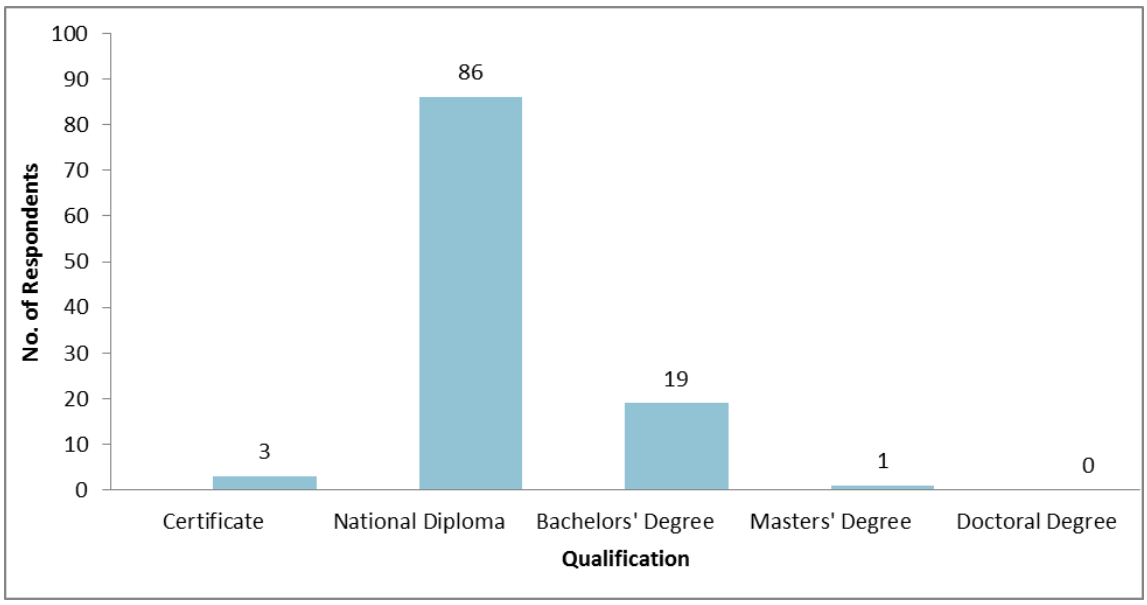


Figure 5.4 Respondents' highest qualification (n=109)

Figure 5.4 shows that 2.8% (n=3) of the respondents held a certificate, while the majority of the respondents 78.9% (n=86) had a national diploma, followed by 17.4% (n=19) of the respondents who held a bachelor's degree. In this census sample of 109 respondents, only 0.9% (n=1) of the respondents held a master's degree and no one had a doctoral degree. These results are also in sharp contrast with those obtained in a study conducted in West Australia which showed that more than half of the study sample of allied personnel had a postgraduate qualification (Stagnitti *et al* 2005:359). However, there is also room for improvement for the majority of respondents with diploma should they receive support to do higher qualifications.

5.3.4 Section 1 Item 4: Respondents' work experience

Item 4 in section 1 of the questionnaire was set to determine the work experience of respondents. In the context of this study, respondents were asked to choose from pre-determined categories of work experience as opposed to providing the actual experience. Results are presented in figure 5.5 below.

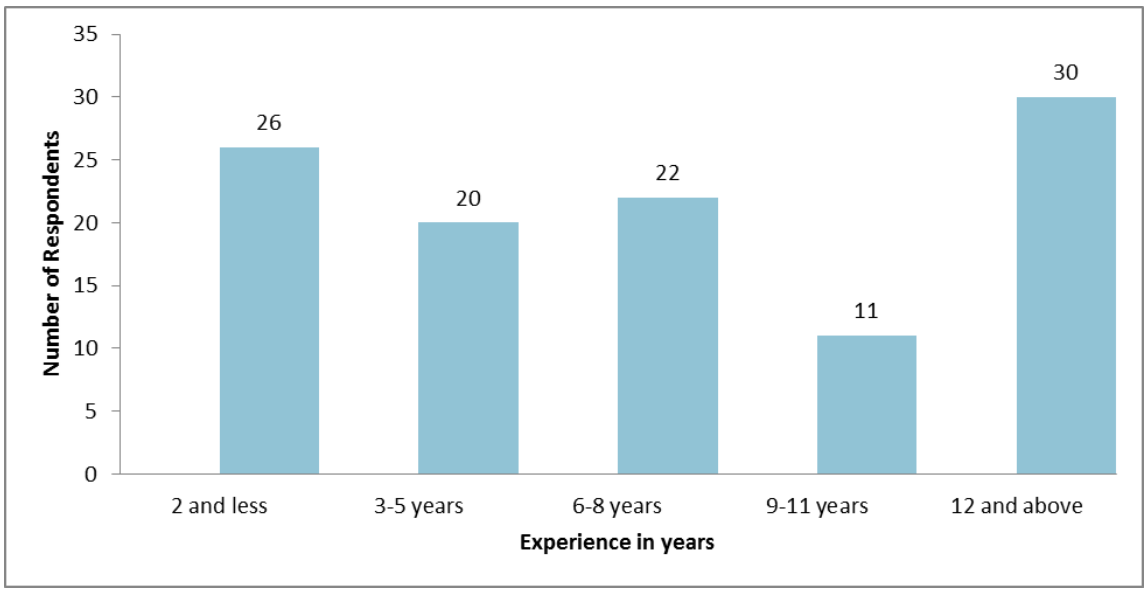


Figure 5.5 Respondents' work experience

According to figure 5.4, the majority of the respondents' (27.5% or n=30) work experience was in the category 12 years and above. This was followed by respondents 23.9%; (n=26) whose work experience fell into the category ≤ 2 years. All community service radiographers fell into this category. The lowest number of respondents' 10.1% (n=11) fell in the category 9 – 11 years of work experience. For the purpose of this study, this variation in work experience by respondents suggest that the respondents were likely to provide meaningful data as a wide range of opinions and views regarding additional core competencies of radiographers working in rural areas could be obtained from both more experienced and less experienced respondents.

It may be important also to consider retaining those radiographers with the work experience between three and eight years for rural areas by investing in them with the aim of making them become rural areas specialist.

5.4 ENVIROMENT IN WHICH RURAL RADIOGRAPHERS PRACTICE RADIOGRAPHY

Items 5 – 14 were set to elicit respondent's opinions and views on the working environment in which they practice rural radiography. The data obtained were used to compliment and expand on the findings from the exploratory phase from which

the working environment was identified as a major theme. The results of each item are analysed and presented in individual tables (5.1 – 5.10).

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5.4.1 Item 5: Organisation of health services in the rural areas.

Item 5 which make reference especially to X-ray asked respondents to indicate whether health services in rural areas were well organised to the respondents' satisfaction. The responses are presented in Table 5.1.

Table 5.1 Organisation of health services in rural areas (n=109)

Are the health services especially x-ray in rural areas well-organised to your satisfaction?	Frequency	Percentage
Yes	30	27.5%
No	79	72.5%
Total	109	100%

The findings in the table above show that 72.5% (n=79) of the respondents indicated that health services in rural areas especially X-ray services are not well organised. While 27.5% (n=30) of the respondents were of the view that health services in rural areas are well organised. The problem of organisation of health services in rural areas was also acknowledged by Cooke *et al* (2011:108) who noted that it was not the case in urban setting.

5.4.2 Item 6: Request of unnecessary x-rays by rural doctors

Respondents were asked in item 6 to indicate whether doctors working in rural hospitals request unnecessary x-ray examinations for patients. Results to this item are presented in Table 5.2

Table 5.2 Request of unnecessary x-rays by rural doctors (n=109)

Do doctors in rural areas request many x-ray examinations which are unnecessary?	Frequency	Percentage
Yes	86	78.9%
No	23	21.1%
Total	109	100%

The results in the above table show that 78.9% (n=86) of the respondents reported

that doctors in rural areas normally send patients for unnecessary x-ray examinations as compared to only 21.1% (n=23) who responded in the negative, which means that they did not agree that rural doctors request unnecessary x-ray examinations.

5.4.3 Item 7: Rural doctors asking for the opinion of radiographers on x-rays

Respondents were requested in item 7 to indicate whether or not rural doctors seek radiographers' opinions on x-ray radiographs. The responses to this item are presented in Table 5.3.

Table 5.3 Rural doctors asking the opinion of radiographers on x-rays (n=109)

Do the doctors in rural areas ask the opinion of radiographers on x-rays?	Frequency	Percentage
Yes	62	56.9%
No	47	43.1%
Total	109	100%

According to the results in Table 5.3, 56.9% (n=62) of the respondents agreed that doctors in rural areas seek the opinions of radiographers on plain radiographs. Similarly, findings of a study conducted by the professional board of Radiography and Clinical Technologist (RCT) under the HPCSA (2014) showed that 81.6% of the radiographers who took part reported that the referring clinician asks for their opinion on x-rays. Slightly below half (43.1% or n=47) of the respondents answered 'No' which means that they were of the opinion that rural doctors do not ask radiographers' opinion on x-rays. Giving opinion on x-ray radiographs is one competency area that radiographers may not have been exposed to during pre-service training but a necessity in rural setting.

5.4.4 Item 8: Rural patients demand to be x-rayed

Under item 8 of the questionnaire, study respondents were asked whether in their opinion patients in rural hospitals demand to be x-rayed even if x-ray imaging was not indicated. The results are tabulated in Table 5.4.

Table 5.4 Patients in rural areas demand to be x-rayed (n=109)

Do patients in rural areas demand to be x-rayed even if the x-ray examination is not indicated?	Frequency	Percentage
Yes	79	72.5%
No	30	27.5%
Total	109	100%

Data in Table 5.4 show that 72.5% (n=79) of respondents agreed that rural radiographic practice is characterized by patient demand for x-ray examination even when the examination is not indicated. Only 27.5% (n=30) disagreed. These results are comparable to those obtained by Mung'omba and Botha (2012:19) in a study on factors influencing patients demand for x-ray examination in rural areas of KwaZulu-Natal.

5.5.5 Item 9: The modernity of equipment in rural hospital

Item 9 requested respondents to indicate whether rural hospitals were equipped with modern equipment. Results from respondents' responses for this item are shown in Table 5.5.

Table 5.5 The modernity of equipment in rural hospitals (n=109)

Are the rural hospitals equipped with modern equipment?	Frequency	Percentage
Yes	22	20.2%
No	87	79.8%
Total	109	100%

The data presented in Table 5.5 under item 9 show that less than a third of the respondents 20.2% (n=22) answered 'Yes' while the majority 79.8% (n=87) of the respondents answered 'No' which implies that they do not agree that rural hospitals are equipped with modern equipment.

5.4.6 Item 10: Absence of specialists (radiologists) in rural hospitals

Item 10 was set to elicit the opinion of respondents on whether the absence of specialists such as radiologists in rural hospitals affected the work of radiographers.

Table 5.6 Absence of specialists such as radiologists (n=109)

Does the absence of specialists such as radiologists in rural hospitals affect the work of radiographers?	Frequency	Percentage
Yes	91	83.5%
No	18	16.5%
Total	109	100%

Out of 109 respondents who attempted the item, only 16.5% (n=18) were of the opinion that the absence of specialists such as radiologists in rural hospitals does not affect radiographers' work. The majority of the respondents 83.5% (n=91) however, agreed that that the absence of specialists have an impact on radiographic practice in rural areas.

5.4.7 Item 11: Rural radiography practice more boring than urban radiography practice

The opinions of the respondents regarding item 11 are shown in Table 5.7 below.

Table 5.7 Rural radiography practice more boring than urban (n=108)

Do you think rural radiography practice is more boring than urban radiography practice?	Frequency	Percentage
Yes	73	67.6%
No	35	32.4%
Total	108	100%

When asked if rural radiography practice in rural hospitals was boring as compared to that of urban hospitals, 73 respondents, representing 67.6% of the total sample answered affirmative. They were of the opinion that rural radiography was boring as compared to urban radiography. Out of 108 who attempted this item, only 32.4% (n=35) of the respondents were of the opinion that rural radiographic practice was not boring.

5.4.8 Item 12: Appropriate competencies to provide imaging services for PHC

Item 12 in section 2 of the questionnaire required respondents to indicate whether rural radiographers had appropriate competencies to provide radiographic services

that are designed to support PHC services. Five respondents did not answer this question.

Table 5.8 Appropriate competencies to provide imaging services for PHC (n=104)

Do rural radiographers have appropriate competencies to provide radiographic services that are designed to support PHC?	Frequency	Percentage
Yes	61	58.7%
No	43	41.3%
Total	104	100%

Interestingly, data in Table 5.8 reveal that out of 104 respondents who answered the question, more than half of them 58.7% (n=61) believed that rural radiographers had appropriate competencies to enable them provide diagnostic imaging designed for PHC. Less than half of the respondents 41.3% (n=43) did not agree that rural radiographers have the appropriate competencies for PHC radiography. This evidence appears to contradict Kautzky and Tollman's (2008:18) assertion that almost 20 years since the transformation and more than 30 years after the famous Alma Ata declaration PHC promises in South Africa, among them reorienting health professionals, remain largely unmet.

5.4.9 Item 13: Rural radiographers' role in management of patients

Item 13 under this section asked the respondents to indicate whether they think rural radiographers' role in the management of patients was appreciated by other health professional especially doctors. The results are presented in Table 5.9.

Table 5.9 Appreciation of rural radiographers' role in management of patients (n=109)

Does rural health professionals especially doctors appreciate the role of radiographers in the management of patients?	Frequency	Percentage
Yes	59	54.1%
No	50	45.9%
Total	109	100%

Responding to this question, interestingly just slightly above half of the respondents 54.1% (n=59) agreed that the role of rural radiographers in the management of patients was appreciated by other health professionals including doctors. Just below half of the respondents, 45.9% (n=50) disagreed that rural radiographers' role in the management of patient was appreciated by other health professionals especially doctors.

5.4.10 Item 14: Representation of radiographers in broader management

The last item, in this section, namely item 14 under section 2 of the questionnaire was set to elicit respondents opinion on whether lack of representation of radiographers in broader management such as at district and at provincial head office had an effect on the overall work of radiographers in rural areas. Table 5.10 show the respondents' responses to item 14

Table 5.10 Representation of radiographers in broader management (n=108)

Do you think that lack of representation of radiographers in broader management (at district and head office) affect the overall work of radiographers?	**Frequency**	**Percentage**
Yes	98	90.7%
No	10	9.3%
Total	108	100%

Table 5.10 reveals that more than two thirds of 108 of the respondents, 90.7% (n=98) agreed that a lack of representation of radiographers in broader management negatively affect the work of rural radiographers. Of the 108 respondents, only ten (9.3%) answered 'No' which means they believed that lack of representation in broader management had no effect of the practice of rural radiographers in any way.

5.4.11. Item 15(a): Issues or challenges encountered in rural radiography

This open-ended item was a follow up on the dichotomous questions dealing with the environment in which rural radiographers practice radiography. This question requested respondents to mention challenges that they encounter in rural hospitals other than those indicated in closed questions 1-15. Only 53 attempted the question. The answers/responses were grouped in categories. It must be noted that some

respondents mentioned more than one challenge. So there were 83 responses from 53 respondents. More than half (n=56) of the respondents did not answer this question.

It must be noted that question 15 (b) was not included in the analysis after it emerged that the answers that the respondents gave were similar to the ones given in question 15 (a). Table 5.11 below presents categories that emerged from the analysis of question 15 (a).

TABLE 5.11 Challenges faced by radiographers practicing rural radiography (Question 15a; N=53)

Categories	Frequency	Percentage (%)
Old x-ray and film processing equipment	19	35.8
Nurses requesting x-rays	15	28.3
No respect by other professionals especially doctors	13	24.5
Staff shortage (Radiographers)	8	15.1
Shortage of x-ray consumables	7	13.2
Delays in having equipment serviced	6	11.3
Difficult to retain staff in rural hospitals	4	7.5
Difficult to be remunerated for overtime worked	4	7.5
Poor infrastructure (small work space/x-ray room)	4	7.5
Doctors unaware of x-ray limitations	3	5.7
Frequency missing	**56**	

Table 5.11 shows that the majority of respondents 38.8% (n=19) who attempted question 15(a) identified old x-ray equipment as the most common challenge faced by radiographers in rural hospitals. This was closely followed by the category 'Nurses requesting x-ray 'where 28.3% (n=15) mentioned it as a challenge. Under this category one respondent wrote;

''*Nurses request x-rays and write any signature for a medical officer.*''

Other respondents reported that in some hospitals doctors sign blank x-ray request forms and leave it with nurses to fill them in whenever the patient comes whom they think may need an x-ray examination. This type of behaviour does not just present a challenge to the radiographers but it also robs these rural patients' access to quality

health care. For instance, a patient who does not necessarily need an x-ray may be sent for the examination. Another category that attracted a fairly high number of respondents 24.5% (n=13) was the issue of non-respect of rural radiographers by other health professionals especially doctors.

> *''Rural radiographers should be taken as professionals not the way it is happening now. We need respect and to be consulted…''* one respondent wrote.

Lack of respect is likely to impact on the participation of rural radiographers in the multidisciplinary health team and consequently undermining the effectiveness of a team. Other less frequent categories included staff shortage (radiographers) (n=8; 15.1%), shortage of x-ray consumables (n=7; 13.2%), delays in having equipment serviced (n=6; 11.3%), difficult to retain staff in rural hospitals (n=4; 7.5%), difficult to be remunerated for overtime worked (n=4; 7.5%), poor infrastructure related to small work space/x-ray room (n=4; 7.5%) and doctors being unaware of x-ray limitations (n=3; 5.7%). It is important however to note that there were challenges that respondents identified which were not included in the closed questions. For instance the issue of small working areas is only commonly found in rural hospitals.

5.5 SOME OF THE ADDITIONAL COMPETENCIES THAT MAY BE REQUIRED BY RURAL RAIOGRAPHERS

Subsection 2.1 of the questionnaire dealt with six constructs related to additional competencies that may be required by radiographers in rural areas. Various items dealing with a single construct were answered on a Likert Scale. There were six constructs from A to F related to some of the core competencies that may be necessary for rural radiography practice. It must be noted that this list of additional core competencies, needed in rural radiography, was not exhaustive.

Results of each item on a given construct are presented in Tables 5.13, 5.15, 5.17, 5.19, 5.22 and 5.24. These tables indicate the respondents distributed responses on a perception rating scale namely 1-strongly disagree, 2 – disagree, 3 – agree and 4 – strongly agree. The responses to individual items are presented in frequencies,

percentages and modes. Doing so helps to obtain, at a glance, the pattern of respondents' opinions about a particular aspect of rural radiography. The estimation of the mean by averaging all respondents' responses for each item and their standard deviation is also presented together with the average mean and standard deviation of each construct (Tables 5.14, 5.16, 5.18, 5.20, 5.23 and 5.25). This is in line with Brown's (2011:13) view when he proposes that in the event of a researcher using means and standard deviations for individual Likert items, he or she should also indicate frequencies or percentages of respondents who selected each option (a nominal scale statistic). For all the six constructs that had Cronbach's alpha of 0.65 or higher, an average mean and standard deviation of all the items/questions under each scale was estimated and presented.

An analysis to find possible relationships between the demographic variables (gender, present post, present grade, qualifications, and experience) and each of the six competency constructs was done using two groups' comparison t-test and one way analysis of variance (ANOVA). For the purpose of this study and as indicated in Chapter 3, only positive relationships (significant results) are presented in this section.

5.5.1 Internal consistency of the eight constructs/competency areas related to rural radiography.

The statistician and the researcher began by first testing the internal consistency for reliability of all the eight constructs/competency areas using Cronbach's alpha estimate in Microsoft excel 2010. Ideally alpha of 0.7 or at least 0.65 is used to indicate acceptable reliability and 0.8 or above to indicate good reliability. Table 5.12 presents the results of reliability testing done on all the eight constructs.

Table 5.12 Measures of internal consistency for all eight construct/competency related to radiographers working in rural areas.

Construct	No. of items	Example of item	Cronbach's alpha	n
Team work in rural healthcare	**5**	A radiographer accepts shared responsibility for patient management	**0.68**	**109**
Required attitude and behaviours by rural radiographers	**6**	Radiographers always respect the views of other healthcare professionals	**0.87**	**109**
Communication in rural radiographic practice	**4**	Rural radiographers are able to communicate effectively with patients from all walks of life.	**0.81**	**109**
Rural radiography and leadership	**4**	Rural radiographer leaders are accountable for the professional leadership of a radiographic team	**0.82**	**109**
Rural radiography and management	**5**	I am aware of budgetary control as related to the required resources for the x-ray unit	**0.80**	**108**
Ethical practice in rural radiography	**3**	A radiographer is required to apply the principle of informed consent in radiographic practice.	**0.76**	**109**
Radiography training	**5**	The training equipped me to be able to adapt to the demands of rural radiography practice	**0.59**	**109**
The role and meaning of CPD in rural radiography	**5**	The CPD seminars include topics that are essentially relevant to rural radiographic practice	**0.41**	**101**

The results in the above table shows that four of the constructs/competency related to attitude and behaviours, communication in rural radiographic practice, rural radiography leadership and management show good reliability with Cronbach's alpha of 0.87, 0.81, 0.82, 0.80 respectively. According to Lobiondi-Wood and Haber (2006:346) internal consistency reflecting a Cronbach alpha value in the range of 0.7 or greater is considered acceptable and therefore reliable. Two of the six constructs/competency related to teamwork in rural healthcare and ethical practice in rural radiography also show acceptable reliability with Cronbach's alpha of 0.68 and 0.76 respectively.

Results for the last two constructs related to radiography training and the role and meaning of CPD reveal poor and very poor reliability of 0.59 and 0.41 respectively and hence were not analysed as valid scales, but their individual items were analysed as Likert type items. This also means that no average mean were done for those two constructs. Strictly speaking a reliability of 0.59 is not bad considering that it was the first time that data collection instrument was used.

5.5.2 Construct A: Teamwork in rural healthcare

Construct A, describes the ratings of respondents' opinions related to teamwork in rural healthcare. Table 5.13 shows the findings pertaining to the views of respondents on teamwork in rural areas as an additional core competency required by rural radiographers. Since there is a great deal of data presented, only those results that stand out will be discussed

Table 5.13 Teamwork in rural healthcare

Item No.	Statement	1	2	3	4	Mode	Total
1	There is cooperation between your x-ray department and the other team members e.g. doctors and nurses.	9 7.3%	26 23.9%	55 50.5%	19 17.4%	3	109 99.1%
2	A radiographer accepts shared responsibility for patient management	0 0.0%	12 11.0%	50 45.9%	47 43.1%	3,4	109 100%
3	A radiographer should respect the professions of other healthcare team members.	1 0.9%	1 0.9%	29 26.6%	78 71.6.%	4	109 100%
4	A radiographer should negotiate with other team members such as doctors for the good of the patients.	1 0.9%	3 2.8%	30 27.5%	75 68.8%	4	109 100%
5	Doctors as members of the rural health team respect the radiography policies and guidelines.	19 17.4 %	42 38.5%	34 31.2%	14 12.8%	2	109 99.9%

Key: 1=Strongly disagree; 2 = Disagree; 3 = Agree; 4 = Strongly agree.

When one looks at the frequencies and percentages in the rows and modal columns of Table 5.13, it is observed that responses for item number 1 – 4 were generally positive. This implies that respondents were generally both in agreement and strong agreement with the statements provided. This is also evident by the modal scores for those items namely 3 and 4.

Respondents however disagreed with statement under item number 5. Out of 109 respondents who answered item number 5, 17.4% (n=19) strongly disagreed with the statement while 38.5% (n=42) disagreed with the same statement namely 'doctors as members of the rural health team respect the radiography policies and guidelines.' These results are consistent with the earlier findings from open-ended question number 15 (a) where category 'No respect by other professionals especially doctors' attracted fairly a high number of respondents (n=13; 24.5%).

Table 5.14 Mean scores for responses for each statement on teamwork in rural healthcare

Item No.	Statement	Mean score ± standard deviation n =109
1	There is cooperation between your x-ray department and the other team members e.g. doctors and nurses.	2.77 ± 0.83
2	A radiographer accepts shared responsibility for patient management	3.32 ± 0.66
3	A radiographer should respect the professions of other healthcare team members.	3.69 ± 0.54
4	A radiographer should negotiate with other team members such as doctors for the good of the patients.	3.64 ± 0.58
5	Doctors as members of the rural health team respect the radiography policies and guidelines.	2.39 ± 0.92
Overall score for Teamwork in rural healthcare		3.16 ± 0.71

Table 5.14 shows the mean score for each statement with respect to teamwork in rural healthcare construct/ competency scale. Generally respondents agreed with most of the statements on the aspects of teamwork in rural healthcare. However, responses were leaning towards disagreeing when consideration was given to whether there was cooperation between the x-ray departments and the other team members e.g. doctors and nurses (item 1). The mean score for responses to item 5 which dealt with the aspects of whether doctors as members of the rural health team respect the radiography policies and guidelines was close to 2, meaning that respondents disagreed with statement under this item. This evidence is consistent with the findings in Table 5.13

The overall mean score for this construct/competency is 3.16; implying that on average most respondents scored higher (agreed and strongly agreed) on teamwork in the rural healthcare Likert scale.

5.5.3 Construct B: Attitude and behaviours for rural radiographers

Under section 2.1 B, respondents' perceptions and opinions on the aspects related to attitude and behaviours required by rural radiographers were sought. The results of the respondents are presented in Table 5.15.

Table 5.15 Attitude and behaviours required by rural radiographers

Item No.	Statement	1	2	3	4	Mode	Total
6	Radiographers in rural hospitals respect each patients' cultural beliefs while in their care.	1 0.9%	6 5.5%	49 45.0%	53 48.6%	4	109 100%
7	Radiographers are aware that behaviours can influence their radiographic performance.	0 0.0%	7 6.4	41 37.6%	61 56.0%	4	109 100%
8	Radiographers always project a positive attitude at all times.	1 0.9%	12 11.0%	51 46.8%	45 41.3%	3	109 100%
9	Radiographers are able to acknowledge the limitation of their knowledge and skills.	0 0.0%	8 7.3%	55 50.5%	46 42.2%	3	109 100%
10	Radiographers always respect the views of other healthcare professionals.	0 0.0%	9 8.3%	55 50.5%	45 41.2%	3	109 100%
11	A radiographer acknowledges each patients' religious beliefs while in her/his care.	2 1.8%	7 6.4%	46 42.2%	54 49.5	4	109 99.9%

Key: 1=strongly disagree; 2 = Disagree; 3 = Agree; 4 = Strongly agree.

The results in the table above show high frequencies and percentages in columns representing agree and strongly agree respectively. This is also evidenced in the modal column where common responses were 3 – agree and 4 – strongly agree. This result implies that respondents were generally both in agreement and strong agreement with the statements provided.

It could however be argued that these results may be biased and therefore could not be regarded as a true reflection of respondents' opinion based on their knowledge and practice. This is because some South African authors have questioned the appropriateness of competencies of graduates despite curriculum reforms (Lehman & Makhanya 2005:143). On the contrary, these results may be true since Van der Horst and McDonald (2001:24) report that attitude and values form part of the outcome based education. The Government of South Africa introduced Outcome Based Education in the early 1990s ((Parker & Walter 2008:72). To this effect it is assumed that these respondents have been through the OBE since the education reforms had a direct impact on the radiography curriculum (Engel-Hills 2005:2a).

Table 5.16 Mean scores for respondents' responses for each statement on attitude and behaviours needed by rural radiographers.

Item No,	Statement	Mean score ± standard deviation n =109
6	Radiographers in rural hospitals respect each patients' cultural beliefs while in their care	3.41 ± 0.64
7	Radiographers are aware that behaviours can influence their radiographic performance	3.50 ± 0.62
8	Radiographers always project a positive attitude at all times	3.28 ± 0.69
9	Radiographers are able to acknowledge the limitation of their knowledge and skills	3.35 ± 0.62
10	Radiographers always respect the views of other healthcare professionals	3.33 ± 0.62
11	A radiographer acknowledges each patients' religious beliefs while in her/his care	3.39 ± 0.69
	Overall score for attitude and behaviours required by rural radiographers	3.39 ± 0.65

By studying the mean scores in Table 5.15, it is observed that all the statements with respect to the construct/competency scale have a mean score close to 3 or 4 meaning that respondents were generally both in agreement and strong agreement with the statements provided. This result is consistent with the findings in Table 5.14. The overall mean score for this construct/competency area is 3.39, meaning that on average most respondents scored higher (agreed and strongly agreed) on attitude and behavior required by rural radiographers Likert scale.

5.5.4 Construct C: Communication in rural radiographic practice

Construct C, dealt with communication in rural radiographic practice. There were four items that addressed the rating responses of the respondents' opinions and perceptions with regard to the aspects of communication in rural diagnostic imaging.

Table 5.17 Communication in rural radiographic practice

Item No.	Statement	1	2	3	4	Mode	Total
12	Rural radiographers are able to communicate effectively with patients from all walks of life.	1 0.9%	13 11.9%	47 43.1%	48 44.0%	3, 4	109 99.9%
13	A radiographer should be able to communicate effectively with other members of the rural healthcare team	0 0.0%	0 0.0%	30 27.5	79 72.5%	4	109 100%
14	A rural radiographer possess culturally appropriate communication skills necessary for the rural working environment	1 0.9%	18 16.5%	38 34.9%	52 47.7%	4	109 100%
15	A rural radiographer is able to identify communication that is appropriate to the client's cultural needs.	1 0.9%	18 16.5%	41 37.6	49 45.00%	4	109 100%

Key: 1=Strongly disagree; 2 = Disagree; 3 = Agree; 4 = Strongly agree.

The results show a bi-modal distribution for Item 12, indicating that respondents were divided on the item. It must however be noted that even though the respondents were divided, they all agreed with the statement and only differed on the strength of the agreement. Forty three point one percent (43.1%) representing forty seven (47) respondents indicated 3 – agree while 44.0% (n=48) of the respondents answered 4 – strongly agree implying that rural radiographer are able to communicate effectively with patients from all walks of life.

On the rest of the items, respondents' strongly agreed with all the statements. This evidence is however in contrast with Towbin *et al* (2011:w48) who found that the majority of malpractices involving radiologists in United States of America, for example, have been associated with inadequate communication.

Table 5.18 Mean scores for respondents' responses for each statement on communication in rural radiographic practice.

Item No.	Statement	Mean score ± standard deviation n =108
12	Rural radiographers are able to communicate effectively with patients from all walks of life.	3.30 ± 0.71
13	A radiographer should be able to communicate effectively with other members of the rural healthcare team	3.72 ± 0.45
14	A rural radiographer possess culturally appropriate communication skills necessary for the rural working environment	3.29 ± 0.77
15	A rural radiographer is able to identify communication that is appropriate to the client's cultural needs.	3.27 ± 0.77
	Overall score for Communication in rural radiographic practice	3.40 ± 0.68

The mean score for the responses on the aspects of communication in rural areas reveals a score close to 3 or 4, indicating that respondents were generally both in agreement and strong agreement with the statements provided. This result is consistent with the findings in Table 5.17.

The overall mean score for this competency is 3.40, implying that on average most respondents scored higher (agreed and strongly agreed) on the construct/competency scale related to communication in rural radiographic practice.

5.5.5 Construct D: Rural radiography and leadership

Construct D, which was related to rural radiography and leadership had 5 items that requested respondents to rate their opinions and perceptions on the aspects of leadership in rural radiography. Their responses are reflected in Table 5.19

Table 5.19 Rural radiography and leadership

Item No.	statement	1	2	3	4	Mode	Total
16	Rural radiographer leaders are accountable for the professional leadership of a radiographic team	2 1.8%	15 13.8%	42 38.5%	50 45.9%	4	109 100%
17	Rural radiographer leaders foster the skills development of other radiographers	9 8.3%	24 22.0%	43 39.4%	33 30.3%	3	109 100%
18	Rural radiographer leaders are able to suggest applicable solutions to departmental problems	3 2.8%	12 11.0%	42 38.5%	52 47.7%	4	109 100%
19	Rural radiographer leaders use critical thinking skills to support clinical decision-making	4 3.7%	13 11.9%	42 38.5%	50 45.9%	4	109 100%

Key: 1=Strongly disagree; 2 = Disagree; 3 = Agree; 4 = Strongly agree.

Results from the above table show that most of the respondents scored themselves very positively on all items except item 17 where a modal score of 3 was observed, indicating that most respondents (n=43; 39.5%) answered 3 – agreed. On this item there was also a substantial number of respondents 20.0% (n=24) who did not agree with the statement that rural radiographer leaders foster the skills and development of other radiographers. This positive rating by respondents appear to contradict the assertion that leadership is not traditionally associated with radiography and therefore represents additional responsibility which according to some authors is

beyond those competencies expected at a point of graduation (Hardy & Snaith 2006:328).

Table 5.20 Mean scores of the respondent's response for each statement related to rural radiography and leadership

Item No.	statement	Mean score ± standard deviation n =109
16	Rural radiographer leaders are accountable for the professional leadership of a radiographic team	3.28 ± 0.77
17	Rural radiographer leaders foster the skills development of other radiographers	2.92 ± 0.92
18	Rural radiographer leaders are able to suggest applicable solutions to departmental problems	3.31 ± 0.78
19	Rural radiographer leaders use critical thinking skills to support clinical decision-making	3.27 ± 0.81
	Overall score for Rural radiography and leadership	3.19 ± 0.82

Table 5.20 above shows that the mean score for statements related to the aspects of rural radiography and leadership were closer to 3, implying that respondents were generally in agreement with the statements provided. The overall mean score for this competency is 3.19, implying that on average most respondents' scored higher (agreed and strongly agreed) on rural radiography and leadership Likert scale.

5.5.5.1 Item 20: Some of the barriers to being a good rural radiography leader

Item 20 was a follow-up question on the concept of rural radiography and leadership. This open-ended question requested the respondents to write down, in their own opinion, what they thought could be some of the barriers that may hinder one being a good rural radiography leader. Only 43 respondents answered this question and gave 57 responses. Table 5.21 shows some of the common responses which were grouped in categories.

Table 5.21 Barriers to one being a good rural radiography leader (Question 20; N=43)

Categories	Frequency	Percentage (%)
Lack of support from hospital management	18	41.9
Workload due to shortage of staff	11	25.6
X-ray department not properly equipped	10	23.3
Lack of interpersonal relationship	8	18.6
Budgetary constraints	7	16.3
Lack of respect from clinicians (Doctors)	3	7.0
Frequency missing	**66**	

Lack of support from hospital management was indicated by 41.9% (n=18) out of 43 respondents who attempted the question. One of the respondents wrote:

> *''This form of no support sometimes leads to feeling of isolation working in rural areas.''*

This comment by a respondent suggests disenchantment by rural radiography leaders. Accordingly, Lehman and Makhanya (2005:139) also noted that lack of support by senior practitioners was likely to aggravate the fact that many graduate radiographers lack appropriate competencies for rural practice. Another category that attracted a high number of respondents 25.6% (n=11) was the workload due to shortage of staff. Unlike their counterparts working in urban hospitals, rural radiography leaders juggle between clinical and leadership duties. Surprisingly, lack of basic leadership skills among the many rural radiography leaders was not mentioned by respondents

5.5.6 Construct E: Rural radiography and management

The responses on construct D, related to rural radiography and management are presented in Table 5.22 below.

Table 5.22 Rural radiography and management

Item No.	Statement	1	2	3	4	Mode	Total
21	I am able to organise workload and patient flow even when there are few radiographers	3 2.8%	3 2.8%	47 43.5%	55 50.9%	4	108 100%
22	I am able to participate fully in hospital committees where the interest of radiography is discussed	3 2.8%	22 20.3%	46 42.6%	37 34.3%	3	108 100%
23	I am aware of budgetary control as related to the required resources for the x-ray unit	8 7.4%	34 31.5%	34 31.5%	32 29.6%	2, 3	108 100%
24	I am aware of the hospital structure and policies including procedures	2 1.9%	17 15.7%	56 51.9	33 30.6	3	108 100.1%
25	I am able to manage human resources in the x-ray department effectively	7 6.5%	17 15.7%	53 49.1%	31 28.7%	3	108 100%

Key: 1=Strongly disagree; 2 = Disagree; 3 = Agree; 4 = Strongly agree

Table 5.22 shows that item 21 received the highest rating score of 4 implying that the majority of the respondents' 50.9% (n=55) strongly agreed that they were able to organise workload and patient flow even when there are few radiographers. The other three items namely 22, 24 and 25 each received a rating score of 3, meaning that the respondents agreed with item statements. This evidence suggests that rural radiography managers are capable of executing management duties related to radiography. This, however, is in contradiction with Olsen and Neale (2005:1219) who expresses concern that this type of management and leadership is seldom included as part of clinical training.

Olsen and Neal's concern may be tenable when one considers the results of item 23 where the respondents were divided. An equal percentage 31.5% (n=34) confirmed that they neither do not agree nor agree with the statement. This implies that those who did not agree were not aware of the budgetary control as related to the required resources for the x-ray unit.

Table 5.23 Mean scores for the respondents' responses for each statement regarding rural radiography and management

Item No.	Statement	Mean score ± standard deviation n =108
21	I am able to organise workload and patient flow even when there are few radiographers	3.43 ± 0.67
22.	I am able to participate fully in hospital committees where the interest of radiography is discussed	3.08 ± 0.82
23.	I am aware of budgetary control as related to the required resources for the x-ray unit	2.83 ± 0.94
24.	I am aware of the hospital structure and policies including procedures	3.11 ± 0.73
25.	I am able to manage human resources in the x-ray department effectively	3.00 ± 0.84
	Overall score for Rural radiography and management	3.08 ± 0.80

Evidence from the above table shows that all the statements have a mean score close to 3 implying that respondents were generally in agreement with the statements provided. The overall mean score for this competency is 3.08, implying that on average most respondents scored higher (mainly agreed) on the construct with respect to rural radiography and management Likert scale.

5.5.7 Construct F. Ethical practice in rural radiography

Construct F, related to ethical practice in rural radiography had only three items which requested respondents to rate their opinions and perception on the aspect of ethical practice with regard to rural radiography. The results are presented in Table 5.18

Table 5.24 Ethical practice in rural radiography

Item No.	Statement	1	2	3	4	Mode	Total
26	A radiographer is required to apply the principle of informed consent in radiographic practice.	0 0.0%	7 6.4%	33 30.2%	69 63.3%	4	109 99.9%
27	It is the responsibility of a radiographer to adhere to the principles of confidentiality.	0 0.0%	1 0.9%	29 26.6%	79 72.5%	4	109 100%
28	Ethical principles require the radiographer to be sensitive to cultural beliefs of the patients	0 0.0%	2 1.8%	42 38.5%	65 59.6%	4	109 99.9%

Key: 1=Strongly disagree; 2 = Disagree; 3 = Agree; 4 = Strongly agree

The evidence from the above indicates the respondents rating in all three items was very high namely 4 – strongly agree. Among the three items, the highest number of respondents 72.5% (n=79) who indicated 4, was observed on item number 27, meaning that the majority of respondents strongly agreed that it was the responsibility of a radiographer to adhere to the principles of confidentiality.

Table 5.25 Mean scores for' responses for each statement on ethical practice in rural radiography

Item No.	Statement	Mean score ± standard deviation n =108
26	A radiographer is required to apply the principle of informed consent in radiographic practice.	3.57 ± 0.62
27	It is the responsibility of a radiographer to adhere to the principles of confidentiality.	3.72 ± 0.47
28	Ethical principles require the radiographer to be sensitive to cultural beliefs of the patients	3.58 ± 0.53
	Overall score for Ethical practice in rural radiography	3.62 ± 0.54

Data presented in the above table reveal that the mean score for each statement under ethical practice in rural radiography scale was close to 4, implying that respondents were generally in strong agreement with the statements provided. The overall mean score for this construct/competency was 3.62, implying that on average most respondents scored higher (agreed and strongly agreed) on ethical practice in rural radiography

5.6 RELATIONSHP BETWEEN RESPONDENTS DEMOGRAPHIC VARIABLES AND THE SIX CONSTRUCTS RELATED TO ADDITIONAL CORE COMPTENCIES

The issue of whether the opinions and views on the six constructs were influenced by respondents' demographic variables namely gender, rank, post grade, qualifications or experience was assessed.

Two group comparison t-test and one way analysis of variance (ANOVA) was used to find if there was possible relationships between the respondents' demographic variables (gender, present post, present grade, qualifications, experience) and each of the six constructs related to additional core competencies required in rural areas. As

indicated in the introduction of this chapter, only those results that show a statistical significance (p-value < 0.05) were presented under this section.

5.6.1 Relationship between the respondents' gender, attitude and behaviours required by rural radiographers

Results of analysis to find if there was a relationship between respondent's gender and overall agreement with attitude and behaviours required by rural radiographers are presented in Table 5.26

Table 5.26 Overall level of agreement with Attitude and behaviours required by rural radiographers by gender

	Mean score ± standard deviation			t-value	p-value
	Male	**Female**	**Diff (Male – Female)**		
Overall level of agreement with attitude and behaviours required by rural radiographers	3.24 ± 0.55	3.47 ± 0.46	-0.23 ± 0.50	-2.30	0.023
Two groups comparison t-test using pooled method showing a statistical significant different overall level of agreement with **attitude and behaviours required by rural radiographers** between male and female radiographers. (p-value < 0.05)					

According to the results presented in Table 5.26 above, it is observed that although male and female radiographers on average tend to agree with the attitude and behaviours required by rural radiographers (mean score > 3), female radiographers score on average higher on the Likert scale (3.47) as compared to male radiographers (3.24) and this difference is statistically significant at 0.05 level (p = 0.023). This means that female radiographers generally provided the most positive responses (agreed and strongly agreed) compared to male radiographers regarding attitudes and behaviours required by rural radiographers.

5.6.2 Relationship between the respondents' gender and rural radiographers' leadership abilities

An analysis was done between respondents' gender and the overall level of agreement with rural radiographers' leadership abilities in order to assess the relationships. Results from this analysis are reflected in Table 5.27.

Table 5.27 Overall level of agreement with rural radiographers' leadership abilities by gender

	Mean score ± standard deviation			t-value	p-value
	Male	**Female**	**Diff (Male – Female)**		
Overall level of agreement with Rural radiographers' leadership abilities	2.29 ± 0.68	3.30 ± 0.64	-0.31 ± 0.65	-2.32	0.022
Two groups comparison t-test using pooled method showing a statistical significant difference on overall level of agreement with **rural radiographers' leadership abilities** between male and female radiographers. (p-value < 0.05)					

According to the data presented in Table 5.27 there was a significant difference between respondents' gender and the overall level of agreement with respect to rural radiographers' leadership abilities. Data reveal that female radiographers score on average higher on the Likert Scale (3.30) as compared to male radiographers (2.29) and this difference is statistically significant at 0.05 level (p = 0.022). This means that female radiographers generally provided the positive responses (agreed and strongly agreed) while male radiographers on average provided negative responses (disagreed) regarding rural radiographers leadership abilities.

5.6.3 Respondents' current post and rural radiographers' leadership abilities

The respondents' current post was assessed against the overall agreement with regard to rural radiographers' leadership abilities. Table 5.28 reflects the results.

Table 5.28 Overall level of agreement with rural radiographers' leadership abilities by present job post.

	Mean score ± standard deviation			p-value
	Radiographer	**Chief Radiographer**	**Assistant Director: Radiographer**	
Overall level of agreement with Rural radiographers' leadership abilities	3.04 ± 0.70	3.43 ± 0.52	3.25 ± 0.69	0.022
(One way ANOVA p-value <0.05). This table show a significant difference in level of agreement with **rural radiographers' leadership abilities** between radiographers, chief radiographers and radiographers who hold the post of assistant director.				

Results from Table 5.28 show that although radiographers, chief radiographers and radiographers who hold the post of Assistant Director on average tend to agree with the aspects related to rural radiographers' leadership abilities, (mean score > 3), there is a difference in their level of agreement: 3.04, 3.43 and 3.25 respectively and this

difference is statistically significant at 0.05 level (p = 0.022).

5.6 SECTION 3: RADIOGRAPHY TRAINING AND RURAL RADIOGRAPHY

This section dealt with radiography training, career support and development. There are two constructs with the first related to the aspects of radiography training and the second related to rural radiographic practice. Given that the reliability of the construct assessing radiography training, according to Table 5.12, was poor (alpha = 0.59), the individual questions under this construct will be described without summing them up to give an overall score on the construct.

5.7.1 Construct A: Radiography training

Construct A under Section 3 of the questionnaire, related to the aspects of radiography training was measured with five items on a four-point Likert Scale. Respondent's responses to the five items are tabulated in Table 5.29 below.

Table 5.29 Radiography training

Item No	Statement	1	2	3	4	Mode	Total
29	The radiography curriculum provides for exposure of radiography students to rural set up during training	35 32.1%	34 31.2%	29 26.6%	11 10.1%	1, 2	109 100%
30	The training equipped me to be able to adapt to the demands of rural radiography practice.	17 15.6%	32 29.4%	38 34.9%	22 20.2%	3	109 100.1%
31	A radiographer is able to maintain a film processor including cleaning and changing chemicals	3 2.6%	17 15.6%	48 44.0%	41 37.6%	4	109 100%
32	My training enables me to formulate innovative solutions to rural radiographic challenges	6 5.5%	25 22.9%	49 45.0%	29 26.6%	3	109 100%
33	Rural radiographers need short courses to supplement their current skills	7 6.4%	12 11.0%	37 33.9%	53 48.6%	4	109 99.9%

Key: 1=strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree

Data presented in Table 5.29 above reveal a bi-modal (1, 2) for item 29. It is observed that 32.1% (n=35) of the respondents strongly disagreed with item 29

statement while almost the same number of respondents 31.2% (n=34) indicated 2-disagree. This entails that majority of the respondents believed that the radiography curriculum does not provide radiography students with exposure to rural setting during training.

Other notable results are those under item 30. Even though 34.6% (n=38) of the respondents rated the statement 3 meaning that they are agreed with the statement that the training equipped them to be able to adapt to the demands of rural radiography practice. There was a substantial number of respondents 29.4% (n=32) who did not agree with the statement, meaning that the training did not equip them to adapt to the demands of rural radiography. This concurs with Reid and Cakwe (2011:37) who noted that since students' learning is driven by assessment, it is important that knowledge, skills and attitude relevant to rural practices are included in the curriculum.

By far the majority of the respondents 48.6% (n=53) strongly agreed with item 33 that rural radiographers need short courses to supplement their current skills followed by 37 respondents representing 33.9% who indicated 3 - agree.

Table 5.30 Mean scores for the respondents' responses for each statement on radiography training

Item No	Statement	Mean score ± standard deviation n =108
29	The radiography curriculum provides for exposure of radiography students to rural set up during training	2.15 ± 0.99
30	The training equipped me to be able to adapt to the demands of rural radiography practice.	2.60 ± 0.98
31	A radiographer is able to maintain a film processor including cleaning and changing chemicals	3.17 ± 0.79
32	My training enables me to formulate innovative solutions to rural radiographic challenges	2.93 ± 0.85
33	Rural radiographers need short courses to supplement their current skills	3.25 ± 0.90

Table 5.30 shows the mean score for each statement under the construct radiography training. Evidence in the above table shows that all the statements have a mean score close to 2 or 3 implying that respondents were generally either in disagreement or agreement, thus towards the center and not extremes. These results are consistent with the findings reflected in Table 5.29.

5,7.2 Item 34: Skills and values that should have been included in the radiography curriculum

As a follow up to questions under Section 3 A, question 34 asked respondents to write down some of the skills and values which, in their own opinion, should have been included in the curriculum so as to equip radiographers with competencies that may be required in rural areas. Only 41 respondents answered this question and they gave 60 responses. The answers were grouped in categories as reflected in Table 5.31.

Table 5.31 Skills and values that may have been included in the radiography curriculum for the benefit of rural radiographers (Question 34; N=41)

Categories	Frequency	Percentage (%)
Provision to rotate students to rural hospitals during training	14	34.1
Basic ultrasound scanning skills	13	31.7
Reporting on plain x-ray films (Skeletal)	11	26.8
Management skills	8	19.5
Darkroom techniques	7	17.1
Basics of local communities culture	6	14.6
Basic clinical assessment	1	2.4
Frequency missing	**68**	

According to the results in Table 5.31, the majority of the respondents 34.1% (n=14) suggested that the contents on the rotation of students to cover rural hospitals should be included in the curriculum. Under this category one respondent wrote:

> ‘‘*I think student radiographers during training should also be sent to rural hospitals for training just to have an experience of the rural working environment.’’*

Supporting this suggestion another respondent added that when students are exposed to rural hospitals during the training there is a likelihood that they will be able to attempt to deal with challenges they may face once qualified and posted to these rural hospitals. Pratt (2005:15) is also of the same view that clinical placement of students avails them proper learning environment. Currently, the experiential exposure for student radiographers is only done in accredited hospitals. These accredited hospitals are all located in urban areas.

Basic ultrasound scanning skills is another area which 31.7% (n=13) of the respondents who answered question 34 said should have been included in the curriculum. Ultrasound is one area where most diagnostic radiographers are required to perform in rural hospitals. This is despite the HPCSA regulation which prohibits unregistered practitioners from performing such duties. One respondent had this suggestion:

> ‘‘*if basic ultrasound scanning skills can't be included in the undergraduate programme then it can be done as a post graduate certificate just as the nurses do with midwifery''.*

In rural areas the opinion of radiographers on radiographic images is mostly or often sought by doctors (Smith, *et al* 2009:2). This, then does not come as a surprise when 26.8% (n=11) of the respondents out of 41 suggested that skills for reporting on plain films (skeletal) should have been included in the undergraduate programme for radiographers.

Other skills with low frequencies that respondents thought should have been included in the curriculum include management skills (n= 8; 19.5%), darkroom techniques (n=7; 17.1%) under this category one of the respondents wrote;

> ‘‘*we should have been taught in detail about darkroom since it is still used in rural and something we do every day.''*

The rest are, basics of local communities' culture (n= 6; 14.6%) and basic clinical assessment (n=1; 2.4%).

5.7.3 Rural radiographic practice

Under this subsection, there were seven dichotomous items (35 – 41) and one open-ended item number 42.

5.7.3.1 Item 35: Ability to do basic clinical assessment of patient's affected area

Under this item, respondents were asked to indicate 'Yes' or 'No' whether those diagnostic radiographers working in rural hospital must have the skill to undertake

limited clinical assessment of the referred patients' affected area. Their responses are presented in Table 5.32 below.

Table 5.32 Radiographers should have the ability to do basic clinical assessment (n=108)

Rural radiographers must have ability to do basic clinical assessment of the affected areas	Frequency	Percentage
Yes	105	97.2%
No	3	2.8%
Total	108	100%

Of the 108 respondents who attempted this item, by far the majority, in fact nearly all the respondents namely 97.2% (n=105) answered 'Yes' implying that they agree with the statement meaning they are in favour of rural radiographers having to be skilled to enable them do basic clinical assessment of patients' affected side. Only three respondents, representing a 2.8% of the total sample of 108 answered in the negative.

5.7.3.2 Item 36: Ability to perform basic obstetrics and gynaecology ultrasound scans

The statement under item 36 was set to determine whether rural diagnostic radiographers must be up-skilled so that they can perform basic obstetric and gyaenecology ultrasound scans. The results are tabulated in Table 5.33.

Table 5.33 Ability to perform basic ultrasound scans (n=107)

Rural diagnostic radiographers must have the ability to perform basic obstetrics and gynaecology ultrasound scans.	Frequency	Percentage
Yes	81	75.7%
No	26	24.3%
Total	**107**	**100%**

Table 5.33 shows that two respondents did not answer the question. However, the majority 75.7% (n=85) of those who answered item 36 were of the opinion that rural radiographers must have the ability to do basic obstetrics and gynaecology sonar. While only 24.3% of the respondents did not agree with the statement.

5.7.3.3 Item 37: Perform basic abdominal ultrasound scan

Item 37 under section 3 of the questionnaire asked the respondents to indicate by a 'Yes' or 'No' answer whether rural radiographers should be up skilled to carry out basic abdominal ultrasound scans. The responses to this question are reflected in Table 5.34

Table 5.34 Perform basic abdominal ultrasound scan (n=108)

Rural radiographers perform basic abdominal ultrasound	Frequency	Percentage
Yes	71	65.7%
No	37	34.3%
Total	**108**	**100%**

Only one respondent did not attempt this item. Table 5.34 reveals that out of 108 respondents 65.7% (n=71) answered in the affirmative meaning that they were of the opinion that rural radiographers must be skilled to be able to do basic abdominal ultrasound scans. Those who answered 'No' numbered 37 representing only 34.3% of the respondents.

5.7.3.4 Item 38: Radiographers asked to do ECG in some rural hospitals

Under this item, respondents were asked to confirm if in some rural hospitals radiographers are required to do ECG. Results are shown in Table 5.35

Table 5.35 ECG done by radiographers in some rural hospitals (n=105)

In some rural hospitals diagnostic radiographers are asked to do ECG	Frequency	Percentage
Yes	33	31.4%
No	72	68.6%
Total	**105**	**100%**

The results show that the majority of the respondents 68.6% (n=72) of the 105 who answered this question said radiographers in rural hospitals do not do ECG. Surprisingly, a sizeable number of respondents 31.4% (n=33) were of the view that radiographers in some rural hospitals are asked to do ECG. It is important to note that this question did not determine if respondents thought it was necessary or

appropriate for radiographers to do ECG.

5.7.3.5 Item 39: Introduction of imaging outreach services to the clinics

In terms of item 39 respondents had to indicate whether rural diagnostic radiographers, like other allied professionals such as physiotherapist and dental therapist, may also start an outreach service in particular sonography to PHC clinics. The descriptive information obtained from the 108 respondents who answered this item is presented in Table 5.36.

Table 5.36 Obstetric ultrasound services to clinics (n=108)

Rural diagnostic radiographers like other allied professionals may also introduce outreach services (obstetric ultrasound) to the clinics	**Frequency**	**Percentage**
Yes	75	69.4%
No	33	30.6%
Total	**108**	**100%**

In response to item 39, more than two thirds of the respondents 69.4% (n=108) were of the opinion that outreach services to the PHC clinics especially obstetric ultrasound may be introduced. Just below a third of 108 respondents representing 30.6% felt that it was not necessary for radiographers to introduce imaging outreach services to the clinics.

5.7.3.5 Item 40: Outreach services used for dissemination of information about x-rays

Item 40 was somehow a follow-up to item 39. Respondents were asked to indicate whether, if and when outreach services are introduced, can be used to disseminate information about x-rays to the communities, Results are shown in Table 5.37.

Table 5.37 Dissemination of information to the communities about x-rays

Rural diagnostic radiographers may use this outreach services to give information to the communities about x-rays once it is introduced	Frequency	Percentage
Yes	92	85.2%
No	16	14.8%
Total	**108**	**100%**

Results from the above table reveal that 108 respondents answered the question. Surprisingly, majority of the respondents 85.2% (n=92) supported the notion that outreach services to the clinics can act as a platform to give information about x-rays to the communities. Very few respondents 14.8% (n=16) answered in the negative.

5.7.3.7 Item 41: Scope of practice for diagnostic radiographers

Item 41 was set to determine whether the current existing scope of radiography limit the role of rural radiographers when caring for the patients. Responses from the respondents are presented in Table 5.38.

Table 5.38 Existing scope of practice for diagnostic radiographers

The existing scope of practice of for radiographers limit the role of rural radiographers when caring for the patients	Frequency	Percentage
Yes	61	58.6%
No	43	41.4%
Total	**104**	**100%**

Data in the above table shows that 104 respondents answered the question instead of 109. Out of 104, below half of the respondents 41.4% (n=43) indicated 'No' meaning that they were of the view that the current scope of radiography practice does no hinder rural radiographers from caring for the patients. However, 61 respondents representing 58.6% answered in the affirmative, meaning that they were of the opinion that the existing scope of practice for radiographers limits the role of rural radiographers when caring for the patients.

5.7.3.8 Item 42: Tasks done by radiographers in rural areas but not part of the scope of radiography.

Item 42 as an open-ended question was added as a follow-up to the dichotomous questions (35=41). This was done to allow for the answers that the researcher could not foresee during the questionnaire development. The answers were grouped into categories as reflected in Table 5.39.

Table 5.39 Tasks done in rural areas but not part of the scope of radiography (Question 42; N= 30)

Categories	Frequency	Percentage (%)
Ultrasound scanning	14	46.7
Doing special examinations without screening equipment (Blind method)	7	23.3
Being asked to interpret x-rays	5	16.7
Supervisory duties	3	10.0
Issues of supply chain management (stores)	2	5.0
Forensic radiography	1	3.3
Doing Electrocardiograms (ECG)	1	3.3
Frequency missing	**79**	

Out of 109 respondents, only 30 of them attempted question 42 and gave 33 responses. Of those who answered question 42, forty six point seven percent (46,7%) representing almost half (n=14) of the respondents reported ultrasound scanning as one task that is being done by the majority of rural radiographers even though it was not part of the scope of diagnostic radiography.

> *''Performing basic ultrasound is not part of the scope of practice for diagnostic radiographers even with clinical training and experience,''* was one typical comment from one of the respondents.

Out of 30 respondents who answered this question, 23.3% (n=7) of them said that they are asked to do special radiological examinations without screening equipment. This reflects the currency and type of the x-ray equipment that is in rural hospitals. The issue of rural radiographers being asked to interpret x-rays even without basic training was once again raised by 16.7% (n=5) of the respondents.

The remaining categories of tasks that rural radiographers were doing but not part of their traditional radiographic practice included supervisory duties (n= 3; 10.0%),

issues of supply chain management-stores (n= 2; 5.0%), forensic radiography (n=1; 3.3%) and doing ECG (n=1; 3.3%).

5.8 CPD ACTIVITIES AND RURAL RADIOGRAPHY

Subsection A, under this section, consisted of Likert type items related to the aspects of the role and meaning of CPD activities in rural radiography while dichotomous items were used to investigate subsection B namely barriers to CPD. Since the reliability for the construct dealing with role and meaning of CPD in rural radiography practice was very poor (alpha = 0.41) according to Table 5.12, the individual items or questions under this construct were described without any combination of items statistics. It must also be mentioned that due to the negative nature of the statement under item 46 (see Annexure VI), it was re-coded before analysis by inversing the scoring of the categories that is; one (strongly disagree) re-coded as four (strongly agree) while two (disagree) became three (agree) and vice versa.

A number of respondents' (n=8) holding the post of community service did not attempt this section dealing with CPD. This may be linked to the fact that when the survey questionnaire was distributed (February to May 2015) community service radiographers have just been in employment for two months. So some of them may have felt that they were not experienced enough to give their opinions on CPD. On the other hand this reflects on the awareness about lifelong learning by newly qualified radiographers.

5.8.1 Construct A: Role and meaning of CPD in rural radiography practice

Section 4 construct A dealt with the aspects of role and meaning of CPD in rural radiography. Respondents were asked to respond to five items (43 – 47) by rating on a four – point Likert scale. Answers are recorded in Table 5.40.

Table 5.40 Role and meaning of CPD in rural radiography practice (n=101)

Item No.	Statement	1	2	3	4	Mode	
43	The CPD seminars include topics that are essentially relevant to rural radiographic practice	27 26.7%	43 42.6%	18 17.8%	13 12.9%	2	101 100%
44	The teaching of CPD activities that I have attended so far have been evidence-based	5 5.0%	23 22.7%	60 59.4%	13 12.9	3	101 100%
45	I attend CPD activities to increase my professional competency	3 3.0%	17 16.8%	45 44.6%	36 35.6%	3	101 100%
46	I (do not) attend CPD activities only to accumulate points required for me to maintain my HPCSA registration	42 41.6%	30 29.7%	23 22.8%	6 5.9%	1	101 100%
47	It is the responsibility of the hospital to foster competency of radiographers through CPD support	6 5.9	20 19.8%	35 34.7%	40 39.6%	4	101 100%

The results in Table 5.40 reveal that the majority of the respondents 42.6% (n=43) did not agree with the statement under item number 43, while 26.6% (n=27) of the respondents strongly disagreed. This means that the majority of respondents (42.6%) did not believe that the CPD seminars include topics that are relevant to rural practice. Similarly, statements under items 44 and 45 were ranked 3 – agree by majority of the respondents namely 59.4% (n=60) and 44.6% (n=45) respectively. This means that respondents agreed with the statements that the CPD they have attended this far was evidence-based and that they attend these CPD activities to increase professional competency. It is interesting to note that the majority of the respondents 41.6% (n=42) strongly agreed with the statement in item 46 followed by 29.7% (n=30) who indicated 3 – agree (reversed). This implies that majority of respondents attended CPD activities only to accumulate points required for them to maintain their HPCSA registration. This evidence appears to violate the core value of CPD which is to enable all health professionals to maintain and enhance their knowledge and skills thereby improving the quality of health care services (HPCSA 2010:1).

Only 40 of the respondents representing 39.6% of those who answered item 47 indicated 4 – strongly agree. This means that they strongly agreed that it was the responsibility of the hospital to foster competency of rural radiographers through CPD support. This was followed by 34.7% (n=35) of the respondents who answered 3 – agree.

Table 5.41 Mean score for the respondents' responses for each statement related to CPD in rural radiography practice (n=101)

Item No.	Statement	Mean score ± standard deviation n =101
43	The CPD seminars include topics that are essentially relevant to rural radiographic practice	2.17 ± 0.97
44	The teaching of CPD activities that I have attended so far have been evidence-based	2.80 ± 0.72
45	I attend CPD activities to increase my professional competency	3.13± 0.79
46	I (do not) attend CPD activities only to accumulate points required for me to maintain my HPCSA registration	1.93 ± 0.94
47	It is the responsibility of the hospital to foster competency of radiographers through CPD support	3.08 ± 0.97

Table 5.41 reflects the mean score for each statement regarding the role and meaning of CPD in rural radiography practice. It is observed that all the statements have a mean score close to 2 or 3 implying that respondents were generally either in disagreement or in agreement. This result is consistent with the evidence reflected in Table 5.40.

5.8.2 Barriers to CPD

Items 48 -52 in the questionnaire focused on the possible barriers that may hinder rural radiographers from accessing or attending CPD activities. Barriers to CPD activities is an area that has been researched into extensively particularly for health professionals. This part however is unique as it focuses on a specific group of health professionals and in a specific geographical environment namely rural area. As indicated in the introduction of section 4 of the questionnaire a number of community service radiographers did not attempt questions under this section and this is reflected in the low number of respondents.

5.8.2.1 Item 48: Hospital providing necessary support for CPD

This item requested the respondents to indicate whether their respective hospitals provide support, such as transport, to enable them attend CPD seminars. Their responses are presented in Table 5.42

Table 5.42 Provision of support to attend CPD seminars (n=101)

Does your hospital provide you with necessary support such as transport to attend CPD seminars	Frequency	Percentage
Yes	46	45.5%
No	55	54.6%
Total	101	100%

According to the above table, less than half of 101 of the respondents who answered question 48 indicated 'Yes' which means they were of the view that rural hospitals do provide some form of support for rural radiographers to attend CPD activities. While 55 respondents representing 54.6% answered in the negative meaning that rural hospitals do not provide support.

5.8.2.2 Item 49: Distance and attendance of CPD seminars/workshops

This item wanted to determine whether distance where CPD activities are held discouraged rural radiographers from attending those CPD seminars.

Table 5.43 Distance where CPD seminars hinders rural radiographers (n=101)

Are you discouraged to attend CPD seminar/workshop because of the distance to where they are held?	Frequency	Percentage
Yes	74	73.2%
No	27	26.8%
Total	**101**	**100%**

Data in the above table reveal that majority 73.2% (n=74) of those who attempted item 49 were of the opinion that they are discouraged to attend CPD seminars because of the distance where they are held. Only 26.8% (n=27) answered 'No' meaning that distance where CPD are held does not discourage them from attending. Gawugah *et al* (2011:333) holds the same view: namely, that a place where the CPD activities are held may cause loss of interest by most health professionals.

5.8.2.3 Item 50: Shortage of staff influence the attendance of CPD seminars

Item 50 solicited respondents' to indicate whether the shortages of staff in their respective x-ray departments hinder them from attending CPD seminars.

Table 5.44 Influence of the shortage of staff on the attendance of CPD seminars (n=101)

Are you unable to attend the CPD seminars because of shortage of shortage of staff in your x-ray department?	Frequency	Percentage
Yes	61	60.4%
No	40	39.6%
Total	**101**	**100%**

As indicated in table 5.44 the majority of the respondents 60.4% (n=101) answered 'Yes' which means that they were of the opinion that shortage of staff in their x-ray departments hinders them from attending CPD seminars. This evidence is in line with Henwood and Flinton (2012:181) who also found that other than staff workload shortage of staff to a lesser extent were barriers towards CPD participation.

5.8.2.4 Item 51: Topics covered in current CPD seminars influence attendance

This item required the study respondents to indicate whether the CPD topics covered in these CPD seminars discourage rural radiographers from attending CPD seminars. Results to this item is shown in Table 5.45

Table 5.45 Type of CPD topics covered influence CPD attendance (n=99)

Are you discouraged from attending CPD seminars because topics covered are irrelevant to your rural practice?	Frequency	Percentage
Yes	37	37.4%
No	62	62.6%
Total	**99**	**100%**

Of the 99 respondents who attempted item 51, more than half 62.6% (n=62) answered in the affirmative meaning that they were of the opinion that they were not discouraged from attending CPD seminars because the topics covered were irrelevant to their practice. Those who answered 'Yes' numbered 37 representing 37.4% of all respondents who answered item 51.

5.8.2.5 Item 52: Lack of rural hospitals support for radiographers to attend CPD activities

This item deals with issues of support by rural hospitals for radiographers to attend

CPD activities.

Table 5.46 Rural hospitals support for radiographers to attend CPD activities (n=101)

Do you think there is lack of support by rural hospitals for radiographers to attend CPD activities?	Frequency	Percentage
Yes	72	71.3%
No	29	28.7%
Total	**101**	**100%**

The results in the above table show that out of 101 of the respondents only 29 of them answered in the negative meaning that they were of the view that rural hospitals do support radiographers to attend CPD activities. However, the majority of the respondents 71.3% (n=72) answered 'Yes' which implies that they believed that there was lack of support for radiographers to attend CPD activities by rural hospitals.

5.8.3 Section C: Suggestions that may be included into CPD strategy proposal

Under this section respondents' were requested to indicate 'Yes' if they agree with the statements which were suggestions that could be included in the CPD strategy or 'No' if they do not agree that the given suggestion could be included in the proposal of the CPD strategy. The responses are reflected in Table 5.47.

Table 5.47 Suggestion for CPD strategy proposal

Statement	Yes	No
CPD activities/programmes must take into account the needs of rural radiography practice	100 (99.0%)	1 (1.0%)
CPD activities must take into account the potential gap between theory and the actual rural practice	99 (97.1%)	3 (2.9%)
CPD seminars must be rotated so as to include rural areas	101 (99.0%)	1 (1.0%)
Each health district must be responsible for their own CPD activities	81 (80.2%)	20 (19.8%)

Table 5.47 shows responses to individual items. The observation is that the majority of the respondents agreed to all the statements implying that these suggestions may be taken into account during the development of a CPD strategy proposal. Only in the last item did 20 respondents representing 19.8% of 101 who attempted this

question answer 'No' meaning that they did not agree with CPD activities being placed under the responsibility of each health district.

5.8.3.1 Item 57: Topics that may be included in future CPD activities/seminars

Under this item, respondents were requested to tick from a pre-determined list of topics or areas of interest that they would like to be covered in future CPD seminars. Respondents were allowed to tick on more than one area of interest if they so wish. Coding was done in such a way that during the analysis topics/areas of interest were ranked in descending order with the highest ranked on top and the list at the bottom and not necessary in the same order as it appears on the questionnaire. The results are presented in Table 5.48.

Table 5.48 Topics that may be included future CPD activities/seminars

Topics/Areas of interest to be included in CPD activities	Frequency	Percentage
Image interpretation (Chest and Skeletal)	96	88.1%
Digital Imaging	88	80.7%
Ultrasound scanning in rural areas	83	76.2%
National Core Standards and rural radiography	81	74.3%
The role of radiography in PHC	80	73.4%
Management in rural radiography	80	73.4%
Leadership in rural radiography	79	72.5%
Ethical aspects of rural radiography	77	70.6%
Supervisory skills	74	67.9%
Communication skills in the context of rural areas	73	67.0%
Drawing of plans e.g.,HRD)	70	64.2%
Critical thinking	69	63.3%
Attributes and behaviours required in rural radiographic practice	68	62.4%
Problem solving	67	61.5%
Team work skills	67	61.5%
Reflective thinking	60	55.1%
Interpersonal relations	58	53.2%
Basic principles of Supply Chain Management	57	52.3%
Customer services skills	52	47.7%
Darkroom techniques	52	47.7%
MRI, CT	50	45.9%
OTHER TOPICS	0	0.00%

The results in Table 5.49 reveal the topics or competency areas which respondents thought should be covered during CPD workshops or seminars. The highest ranked topics include image interpretation (Chest and Skeletal) recording a frequency of 96

representing 88.1%. Comparable results were obtained in a study conducted in Hong Kong where x-ray film reporting and intravenous contrast injection attracted a high number of respondents. This was followed by digital imaging (n=88; 80.7%), ultrasound scanning in rural areas (n=83; 76.2%), National Core Standards and rural radiography (n=81; 74.3%), the role of radiography in PHC (n=80; 73.4%), Management in rural radiography (n=80; 73.4%), Leadership in rural radiography (n=79; 72.48%) and the Ethical aspects of rural radiography (n=77; 70.6%).

These results suggest that rural radiographers require a two-fold competency development. Firstly, it is the competency expansion development which means radiographers expanding their competencies into areas within imaging which were not part of the scope of radiography e.g. plain film interpretation and ultrasound scanning. Secondly, it is the competency extension development which entails rural radiographers extending their roles into other areas other than imaging.

5.9 Item 58: Factors that differentiate rural radiographic practice from urban practice

Under this open-ended question, respondents were asked to mention what factors. in their own opinion, make rural radiographic practice different from urban radiographic practice. Their answers were grouped into categories as presented in Table 5.49

Table 5.49 Factors that make rural radiography practice different from urban practice (Question 58; N=43)

Categories	Frequency	Percentage (%)
Old x-ray equipment in rural areas	25	58.1
Rural areas are poorly resourced (e.g. only one x-ray machine)	13	30.2
Radiographer doing everything (generalist)	8	18.6
Staff shortage	8	18.6
No radiologists on site	7	16.3
Doing one type of x-ray examinations (Chest x-ray)	2	4.7
Patients will always thanks a radiographer after being x-rayed	1	2.3
Frequency missing	**66**	

Results in Table 5.49 show that the majority of respondents 58.1% (n=25) believed

that the use of old equipment in rural areas makes rural radiography practice different from the one practiced in urban. One respondent summed up the issue of old equipment in rural areas with these words;

> *"in rural areas everything is traditional including equipment.''*

Another respondent summed up the difference between rural radiography practice and urban practice as follows;

> *''In rural areas you are everything and everyone from receptionist, PRO, diagnostic radiographer, ultrasonographer, darkroom attendant, filing clerk, radiologist, interpreter etc, while in urban radiography you are either a diagnostic radiographer or ultrasonographer.''*

5.10 Item 59: Three important tasks performed on regular basis in rural hospitals

Respondents were requested to mention three most important tasks which are performed on regular basis in rural hospitals but not in urban hospitals. During analysis the tasks were grouped in categories and are shown in Table 5.50 below.

Table 5.50 Three most important tasks performed on regular basis in rural hospitals but not performed in urban hospitals (Question 59; N=29)

Categories (task)	Frequency	Percentage (%)
Single radiographer doing everything (Administration, Clerical Radiographic etc.)	21	72.4
Processing of x-rays in the darkroom	20	69.0
Being asked to comment on x-rays	4	13.8
Attending hospital meetings	4	13.8
Frequency missing	**80**	

Only 29 respondents attempted item 59. The category that attracted the highest number of respondents 72.4% (n=21) was one were a single radiographer was doing everything such as administration, clerical, imaging etc. Similarly literature review on rural physiotherapists in Australia revealed that their practice goes beyond the scope of physiotherapy practice and spans across disciplines (Minisini *at al* 2011:5).

Another responsibility that is regularly performed in rural hospitals but not in urban hospitals, and which attracted almost the same number of respondents 69.0% (n=20) was processing of x-rays in the darkroom. The other two tasks namely being asked to comment on x-rays and attending hospital meetings were mentioned by the same number of respondents (n=4 or 13.8%).

5.11 CONCLUSION

This chapter discussed quantitative data analysis and interpretation with the help of bar charts, frequency distribution, tables and description. The analysis was based on 109 respondents (89.7% response rate). This chapter also revealed the opinions and views of rural radiographers with regard to additional core competencies required for rural radiography practice. Data analysis also revealed some of the suggestions that may be included in the proposed CPD strategy.

In next the chapter, the researcher discusses the results of the curriculum audit and compares them with the study results. The CPD strategy proposal is also presented in the same chapter.

CHAPTER 6

CURRICULUM AUDIT AND DEVELOPMENT OF THE CPD STRATEGY PROPOSAL

6.1 INTRODUCTION

This chapter serves a dual purpose. The first purpose is to present and discuss the results of the audit of the curriculum. The audit results are then compared with results of the study. The first part of Chapter 6 is thus relevant to the following objective as indicted in section 1.4.3 of Chapter 1, namely, to:

- analyse the curriculum of a radiography training school in an area where the study was done and compare with the study results to determine competencies that may not have been included in the curriculum.

The second purpose of this chapter is to present the discussion on the procedure that was followed in the development of the CPD strategy targeted at radiographers working in rural areas. The information in the second part of Chapter 6, therefore, addresses the following objective as indicated in section 1.4.3 of chapter 1 of this study:

- Propose a CPD strategy for rural radiographers based on the results of the study

A number of items were constructed (refer to Annexure VI) in order to achieve the above mentioned objectives.

6.2 CURRICULUM

The radiography curricula in South Africa are offered at tertiary institutions and accredited by the HPCSA. Completing the curriculum enables graduate radiographers to register for professional membership. Registration with HPCSA allows graduates to practice their profession. While the HPCSA needs to be assured

that the radiographers as products of these curricula are proficient practitioners it is equally important that these curricula reflect the demands of the diverse environments in which these radiographers practice.

When embarking on this research in March 2012, majority of the universities of technology were offering a three-year diploma qualification but with the passage of time the four-year degree programme has since been introduced and extended to more universities of technology. To this effect universities of technology, majority of which provide radiography training, are phasing out the three-year national diploma qualifications, whose curriculum was audited, in favour of a four-year degree.

6.2.1 Purpose of curriculum audit

The purpose of undertaking the curriculum audit was to meet one of the study objectives as indicated in section 6.1 above. This objective was achieved through the analysis of a summary of the curriculum document together with a handbook for 2014 produced for the Faculty of Health Sciences from the same university.

It is must be emphasised that the audit that was done on the curriculum was not a curricular quality control audit, but was merely done to establish the extent to which it met the expectations of rural radiography practice.

6.2.2 Sample document

Only one curriculum document that was obtained from one the universities of technology was used. It must be stressed that the choice of only one curriculum was influenced by the context in which the study was conducted. In other words it simply means that there is only one radiography training school in the province where the study was conducted. The researcher decided to also include the Handbook for 2014 in the audit because the curriculum that was received was highly summarised. The Handbook is about the courses offered in the faculty and contents of these courses. The assumption made by the researcher was that the summery curriculum document and the Handbook were relevant to the study respondents and therefore reflective of the training that these respondents went through.

6.2.3 Methodology for auditing the curriculum

Reviewing of the curriculum and the yearbook documentation was done using an auditing instrument that was developed specifically for that purpose (see Annexure IX).

6.2.3.1 Procedure

A letter requesting permission to audit the radiography curriculum was sent to the university. The approval was granted (see Annexure III) on condition that a summary of key findings of the research should be submitted to the Institution Research Council (IRC) of the concerned university of technology.

Numerous attempts to remind the institution about the request were made before the concerned school of radiography could release the document. When the document finally came it was a summarised version consisting of very few pages. This, as mentioned earlier, prompted the researcher to supplement the summarised curriculum with the Handbook for 2014 produced for the faculty of health sciences of the same university. The Yearbook for 2014 was more elaborate and thereby making contents more reliable and complete document to analyse.

6.2.3. 2 Audit instrument

Since this was not a curricular quality control audit, the audit instrument which was adapted and modified focused on themes and areas of interest that arose from the data analysis of both qualitative and quantitative phases of this study. The audit instrument also made provisions for assessing the weights of a given skill/competency area through the use of credits.

According to SAQA (2000:9) the credit system equates 1 credit to 10 notional hours. Similarly, Maphosa, Madzielwana and Neshefhefhe 2014:359) referred to a credit as a numerical value where 1 credit = 10 notional hours of learning. This means that a module with 12 credits will be equal to 120 hours of learning (Kilfoil 2015). The weighting assisted in determining how much emphasis was placed on a given

skill/competency area in terms of time to master the content or skill. The audit tool also made provision for comments for example whether the skill/competency was to be obtained either through theory or practice or both. (see Annexure IX).

To increase validity and reliability the audit instrument was sent to the study supervisor for approval. The researcher sought the supervisor's approval because she has journeyed with the research and was aware of its objective.

6.2.4 Results of the curriculum audit

The curriculum audit was based on set criteria as indicted in section 6.2.3.2 above. The results of the audit are presented in Table 6.1 below.

Table 6.1 Results from the audited curriculum

Areas/Competencies identified in the study	Referenced in the curriculum	credits	Theory Practice	Comment/Observation
Team work	No			Team work has been found to be effective in any work environment but no reference is made in the curriculum.
Attitude and behaviours required in rural areas	No			Important competency area in rural work environment
Communication in rural radiographic practice	Under broad subject Psychodynamics of patient management	12	Theory 60% First aid/practical tests 10%	An argument could be put forward that communication is universal and adaptation for each situation could be made. Nevertheless, it was indicated in this study that very specific communication skills are needed in rural areas.
Leadership	No			It is not explicitly stated but then could be dealt with under management
Management	Under broad subject Radiographic management	12	Theory tests 50% Presentations 15% Assignments 35%	No direct mention of management practice
Ethical practice in rural radiography	No			
Problem solving	No			Rural radiographic practice is full of issues and problems which often require creative way of solving them.
Basic ultrasound scanning skills	No			From maternal and foetal wellbeing perspective very important in contribution towards decreasing mortality at least for obstetrics
Basic plain film reporting	Under broad subject Radiographic practice (II) and (III)	42	Theory tests 50% Practical tests 25%	There are 12 other learning areas. This means basic plan film reporting is likely to receive less attention even though results of the study suggest that it is an important competency area in rural areas
Radiography in Primary health care	No			There was no evidence of areas related to PHC in the curriculum. It is important not only for rural areas but it is a skill often needed during community service year
Lifelong learning	No			Not mentioned though is part of OBE
Rural clinical placement during training	No			Clinical placement done only in urban hospitals
Basic clinical assessment of affected areas	No			

6.2.4.1 Curriculum response to the needs of rural radiography practice

The need for the audited curriculum to respond to the needs of rural radiography practice was not explicitly mentioned. This was observed in the mission statement when it was assessed for elements of community oriented and in particular those related to rural radiography practice. There was no direct evidence. As reflected in Table 6.1 above very few skills/competencies that were identified in the study results as being essential for rural radiographers were mentioned or referred to in the audited curriculum. It must be noted that this is the curriculum that most respondent in the study went through. It was also clear from the audit results that there was not much emphasis placed on those competencies that were identified in the study and included or referred to in the curriculum when one considers the credits allocated.

6.2.4.2 Communication in rural radiography

Table 6.1 above shows that communication was covered in the first year of study under a broad subject namely, psychodynamic of patient management. This broad subject covered other learning areas such as patient care and professionalism and ethics and together they were allocated 12 credits which are equal to 120 notional hours of learning. In this area theory accounts for 60% while practice is only allocated 10%. The study results show that there was a challenge when it comes to communication in rural areas because many patients are not educated. Despite such challenges the curriculum does not place emphasis on communication skills for radiography students in general and those radiographers destined for rural practice in particular. This supposition is made based on the number of credits allocated. The allocation of credits entails that there is minimal time allocated to practice communication skills for instance in the clinical area with the actual patients.

6.2.4.3 Management in rural radiography

Another skill/competency which was identified by the respondents in the study as being essential for effective rural radiography practice and which appears to be included in the audited curriculum is management. The document made direct reference to management under a broad subject namely, radiographic management

and is covered in the third year of study. Surprisingly, all the learning areas covered under this subject were also identified in the study as being important for rural radiographic practices. The difference is that evidence from the study suggests that management was either not covered or partially covered during the training. For example, one participant, who took part in Phase I of the study said;

> *''I was not trained in HR but I'm expected to handle issues such as disciplinary procedures since I'm a supervisor.''* (Subsection 4.2.4.2.5).

This assertion is consistent with the results obtained from Phase II of the study where respondents ranked management in rural radiography (n=80; 73.4%) among the highest competency areas that should be covered in CPD seminars or workshops.

This mismatch may be attributed to the fact that emphasis is placed on theory other than practice. This then is contrary to the claim made in a study done by Pratt (2005:229) where she concluded that practical management in radiography practice should be emphasised in the curriculum more than theory based management. The curriculum further shows that management principles are extended into the fourth year of study. But this is likely to benefit only a few radiographers as the majority exit at diploma level (see Figure 5.4). This is so because one can exit either at diploma or graduate level and be able to register with HPCSA as a practitioner.

6.2.4.4 Basic reporting on plain x-ray films

Basic reporting on plain x-ray film is referred to in the audited curriculum under the topic of pattern recognition. This is covered in both second and third year under broad subjects' namely radiographic practice II and III. Apart from pattern recognition as a learning area, in 2nd year there are 11 other learning areas and 15 learning areas under the same broad subject in the 3rd year. In 2nd year the broad subject is allocated 30 credits which is equal to 420 notional hours of learning while in the 3rd year 42 credits are allocated to the broad subject. Basic reporting is one competency area which is encountered by rural radiographers almost on daily basis. It is evident from both phases of the study that basic reporting on plain x-ray films was an important competency area for radiographers working in rural areas. Results of the study show that rural radiographers' opinions on plain x-ray films are sought

on regular basis by rural doctors, especially junior doctors.

6.2.4.5 Other skills/competencies

The audit revealed that the curriculum did not make reference to most of the competencies that were identified in the study as being essential for rural radiographic practice. These findings are in contrast with Engel-Hills' (2005:220) suggestion that a radiography curriculum must address not just core radiographic competencies but also generic competencies if it was going to be responsive to the demands of modern work environment. The competencies which were identified in the study results as being essential for rural radiography practice but not mentioned or referenced in the audited curriculum include;

- Doing basic ultrasound scanning
- Role of diagnostic radiographer in PHC
- Teamwork
- Customer relations skills
- Darkroom techniques
- Ethical practice in rural radiography
- Problem solving
- Attitude and behaviours required in rural radiography
- Interpersonal relationship
- Leadership
- Clinical placement in rural facilities for work integrated learning
- Basic clinical assessment of patients affected area

If one was to succeed in rural radiography practice one must make an attempt to acquire the above listed competency areas that have been identified in the study as essential. Interestingly, the majority of them are generic competencies which means that they are shared by health professionals but transcend the barriers of practice (Lin *et al* 2009). Even though graduate radiographers may have practical knowledge in the core clinical areas, rural environment on the other hand is not just clinical but is often based on the multidisciplinary approach which a graduate who went through this curriculum may not have. To this effect, Anderson *et al* (2012:643) is of the

view that education system may have effects on the way one behaves in rural practice.

May be the second last item on the above list namely clinical placement in rural facilities could to some extent address some of the competency areas identified in the study. In the same way, Engel-Hills (2005: iv) suggested that there was need for collaboration between training institutions and clinical radiographic institutions. For instance, exposing the students to rural work environment could help in the correlation between theory and practice.

6.2.4.6 Lifelong Learning - CPD

There was no indication in the curriculum to suggest that students were prepared for lifelong learning after graduation. This though is against the backdrop that OBE was designed to create a lifelong learner (Malan 1997:3). Moreover, enabling people to become lifelong learners was one of the aspirations that were embodied by the NQF (Parker & Walter 2008:71).

6.3 DISCUSSION ON CURRICULUM AUDIT RESULTS

This section presents a discussion on the results emanating from the curriculum audit.

The audited curriculum is set to expire in 2017 when the last group of student pursuing a diploma qualification complete the course. From then onwards there shall be no diploma course in diagnostic radiography. Thus, the course of which the curriculum was audited is migrating to a full bachelors' degree programme as from 2015.

The audited curriculum provides an overview of how the training institution was responding to the need of radiography services. Although the curricula at various radiography training institutions provides for training of radiographers, there was no clear evidence in the audited curriculum regarding additional core competencies required by radiographers working in rural areas. Moreover, the audited curriculum

document never made reference to the concept of competency. This, though, is despite the fact that the concept of competency has become widely used in the healthcare services (Scott. Tilly 2008:58). The non-reference to the concept of competency in the audited curriculum might be due to the fact that learning contents and processes are determined by individual region or institution (Malan 1997:3).

The radiography curriculum that was audited and compared with the study results, articulates clearly the knowledge and skills that are related to the technical competencies which is crucial to the job in this case radiography. Nevertheless, there are competencies which are missing from the curriculum but were identified in this study as being equally important especially for rural radiographic practices. The absence of these competencies from the curriculum entails that graduate radiographers are not exposed to them and only encounter them once employed in rural areas. This evidence is supported by the results which are reflected in Table 5.29 of Chapter 5 where a bimodal (1, 2) with regard to item 29 was observed. It was observed that the majority of the respondents namely 32.1% (n=35) and 31.2% (n=34) strongly disagreed and disagreed with item 29 statement respectively, stating that the radiography curriculum does not provide radiography students with exposure to rural health circumstances during the pre-service training.

Evidence from the present study shows that majority 35% (n=35) of respondents disagreed that the curriculum used to train them made provision for rural exposure during training (Table 5.29). These results imply that the training institution failed to take into account that radiography education has, according to Prat (2005:275), a pedagogic discourse meaning that it is influenced by other external factors. This then requires an inter-sectorial collaboration between and among concerned parties to identify what sort of competencies ought to be included in the pre-service trainings curriculum. For instance, health professionals in other countries such as Australia lend immense support to training institutions to develop curriculum that leads to the development of student's competencies such as reflective skills (Baird 2008).

The audited curriculum did not make any reference to role extension *vis-ă-vis* additional competencies necessary for rural radiographic practice. This evidence is in contrast to the results of the study done in the UK where it was found the out of 19

radiography curricula reviewed 14 made reference to role extension (Price 2006:203).

For instance, basic reporting on plain x-ray films as competency for rural radiographers emerged throughout the study. Though it is somehow covered in the curriculum it is only done in the third year under a broad subject namely 'Radiographic practice III' which is divided in 12 areas of learning. Despite that the curriculum does not place much emphasis on reporting on plain x-ray films by radiographers even though it is an area which was frequently encountered by radiographers in rural areas. Evidence from this study reveals that 56.9% (n=62) of the respondents reported that doctors in rural areas seek the opinions of radiographers on plain radiographs (Table 5.3). Even with the overwhelming evidence which shows that doctors in rural areas frequently ask for the opinion of radiographers on plain x-ray films, the curriculum places no emphasis on this competency. Elsewhere, evidence suggest that radiographers where able to report on a broad range of adult chest x-rays with satisfactory accuracy after undergoing an accredited programme (Piper, Cox, Paterson, Thomas, Thomas, Jeyagopal & Woznitza, 2014:98).

There are other competencies that are not referenced in the curriculum which the study results show that they were equally important and should have been included in the curriculum. For instance results of this study showed that 65.7% (n=71) respondents were of the opinion that rural radiographers should be skilled to be able to do basic abdominal ultrasound while 75.7% (n= 81) agreed that rural radiographers must be up- skilled to do basic abdominal and obstetric ultrasound scans (see Tables 5.34 and 5.33 respectively). In the context of rural areas where the burden of TB is high the use of ultrasound, to help the doctors in the diagnosis of disseminated TB, is very important. Published evidence shows that ultrasound scan of the abdomen and pericardial area is an essential supplementary investigation in the diagnosis of disseminated TB (Patel *et al* 2011:39).

Rural radiography practice is linked to PHC. This means that radiographers must be appropriately equipped to deliver diagnostic imaging that is in line with PHC demands. Despite the paradigm shift towards the PHC system the audited curriculum

does not make reference to PHC. On the contrary, some training institutions such as the University of Cape Town have since adopted a policy on PHC approach (Irlam, Keikelame & Vivian 2009:8). The adoption of the policy, according to the same authors was done so as to prepare graduates for the demands of the new health system.

Lack of inclusion of PHC in the curriculum entails a deficit in the competencies of graduate radiographers that may enable them to respond to the needs and challenges of PHC (Lehmann 2008:164). Accordingly, this evidence is consistent with the findings of this study which shows that respondents have ranked the role of radiography in PHC (n=80; 73.4%), among the highest ranked topical areas that should be covered by CPD activities (Table 5.48). These results further reflects the aspirations of the DoH's policy document on PHC which called for retraining and reorienting of all healthcare professionals (Strasser *et al* 2005:134).

According to Suter *et al* (2009:41) the ability of a rural radiographer to work with other health professionals could be considered as a critical factor of professional practice that may need specific competencies. However; the audited curriculum did not make any reference to teamwork even though it was identified in the study results as being important for rural radiography practice. Elsewhere the curriculum framework addresses skills, attributes and knowledge such as planning and organising, human resource management and teamwork (Pratt 2005:15). The available evidence from this study suggests that there are limitations in the current curriculum. Similarly, participants who took part in a study conducted by Smith (2005:4) also mentioned that there was limitation in the training provided to prepare and support medical practitioners in rural practice.

The curriculum did not make reference to CPD and lifelong learning for graduates after formal training. This is in contrast with the results of the study conducted in the UK where it was found that out of the 19 institutions whose curricula were analysed seven mentioned the need to prepare graduates for CPD and lifelong learning (Price 2006:171).

It is imperative that the radiography curriculum reflects on current rural practice.

This demands a comprehensive plan which focuses on alignment of the curriculum to prevailing conditions and evaluation. Even though radiographers may develop for instance problem-solving abilities, through experience, it is important to include these skills in the learning phase as this process enhances the development of professional expertise (Yates 2011:224). Similarly, results from the study show that respondent ranked problem solving (n=67; 61.5%) high among the topics that could be covered during CPD seminars or workshops. This entails that if such areas were included in the curriculum, radiographers could have been equipped during pre-service training. This argument is supported by the evidence from a study conducted in the USA by Kowalczyk and Mazal (2006: 274) which found that the radiography managers were of the view that clinical curriculum for undergraduate radiographers should equip radiographers with departmental system management and human resource administration as core competencies. Integrating competencies such as problem solving and innovations in the curriculum for health professionals, such as radiographers, was also one of the recommendations in the WHO‘s report on knowledge for better health: strengthening health system (WHO 2004:131).

The results of the audit further reveal that the curriculum does not have any course/module that relates explicitly to rural radiographic practical attachment. The document made mention of Work Integrated Learning (WIL). The programme however does not refer to placement of students in rural hospitals so that they could have hands on experience. The WIL that is mentioned in the curriculum refers to placing of students in accredited hospitals which are based in urban. On the contrary, results of this study show that respondents (n=14; 34.1%) who took part in the study suggested that curriculum should have made provision for rotation of students to rural areas for experiential attachment (Table 5.31). This evidence reinforce the findings of an evaluation conducted on nine South African universities' faculties of health which showed that most of the universities fall short when it came to preparation of students for rural practice (Reid & Cakwe 2011:34). The same authors argue that values of rural placement afford student with hands-on practical experience. This argument is consistent with the 2012/13 – 2016/17 DoH's Human Resource for Health (HRH) strategy which argues for the regulation of clinical training at both levels namely undergraduate and postgraduate to ensure that rural exposure is included in the training (DoH 2011:125).

Evidence from this study lends support for a broader view of the radiography curriculum more especially during the time of review or evaluation. Results from this curriculum audit suggest that there are areas within the curriculum that may need improvement if it was to be responsive to the needs of rural radiography practice. For instance, the audit shows that the curriculum does not include or explain the events such as budgeting or budget constraints or redundancies, all of which are part of rural radiographers' daily experiences. It may not be possible at present to develop a specific curriculum for rural radiographers but attempts must be made to have a curriculum that reflects issues of rural radiography competencies among its objectives and learning areas.

It is evident that students who have gone through the audited curriculum were trained in an environment which confines them to the agreed behavioural norms. The results suggest that the curriculum does not acknowledge the extent of the required competencies for rural radiographers. The findings of this audit further suggest that radiography training institutions have the task of developing a curriculum that, according to Baird (2008:e9), does not just encourage educating or training of student radiographers the way it has been always. Baird added that universities and other radiography training institutions should aim at developing curricula that may lead to the development of radiographers' reflective skills and reflective practice.

The foregoing evidence raises a concern that the current move from the diploma to the degree programme could continue to be unduly influenced by the contents of the diploma course that is being phased out (Pratt 2005:126). To this effect, one is bound to ask the question, does the new curriculum encompass the unmet competency needs of rural radiographic practice? This is so because it is assumed that any development or any curriculum review that takes place is heavily influenced by empirical evidence. Thus, the current study highlights the possible competency areas that could have been included in the current curriculum which expires at the end 2017. It may be beneficial if the identified competencies could have been included in the curriculum to help prospective rural radiographers make explicit connection to rural radiographic practice.

6.3.1 Conclusion on the audited curriculum

The above discussion on the curriculum audit results show that there is a big difference between the competencies needed to practice radiography in rural areas and what actually many radiographers possess upon graduation. The audited curriculum, when compared with the study results, appears to focus on minimum competencies reflecting contemporary practice. Based on these results the researcher concludes that the radiography training institutions have not yet acknowledged the increased responsibilities placed on rural radiographers resulting in demand for additional competencies and consequently the need to widen the scope of radiography. Since the gaps in competencies that have been identified in the study can only be included in the curriculum when it is revised, it may be worthwhile to consider addressing some of them through deliberately designed CPD activities.

6.4 THE CPD STRATEGY

As indicated in the introduction of this chapter, the chapter had a dual purpose one of which was to present the process that was followed in the development of the CPD strategy. The proceeding section presents the discussion regarding the process.

The Oxford Advanced Learner's Dictionary (2005:1461) defines strategy as a plan intended to achieve a particular purpose or goal. The aim of this study was to investigate the additional core competencies required by radiographers working in rural district hospitals of KZN in order to propose a CPD strategy which takes into consideration the specific needs of the rural work environment.

The purpose of CPD for health professionals has been dealt with in the literature review under Chapter 2. Tame (2009:6) noted that CPD was directed at maintaining and updating a given practitioner's knowledge and skills and by doing so improving the quality of health care given to the patients

The current paradigm shift of the South African health system towards PHC with a focus on preventative care provides a challenge for rural radiographers to develop solutions that are change focused. To this effect, one of the study objectives and the

real contribution of this study was to propose a CPD strategy for rural radiographers. In an attempt to meet this objective, the researcher used information namely from the literature review and the results of data analysis from both phases of the study. The researcher also applied logical reasoning in the process. Logical reasoning according to Nickerson (2010:2) is a process that involves one drawing conclusions or inferences. Furthermore, the researcher sought the opinion of experts, senior study participants from Phase I and the study supervisor as a validation mechanism.

Figure 6.1 below shows the diagrammatic presentation of the process followed in the development of the CPD strategy for rural radiographers.

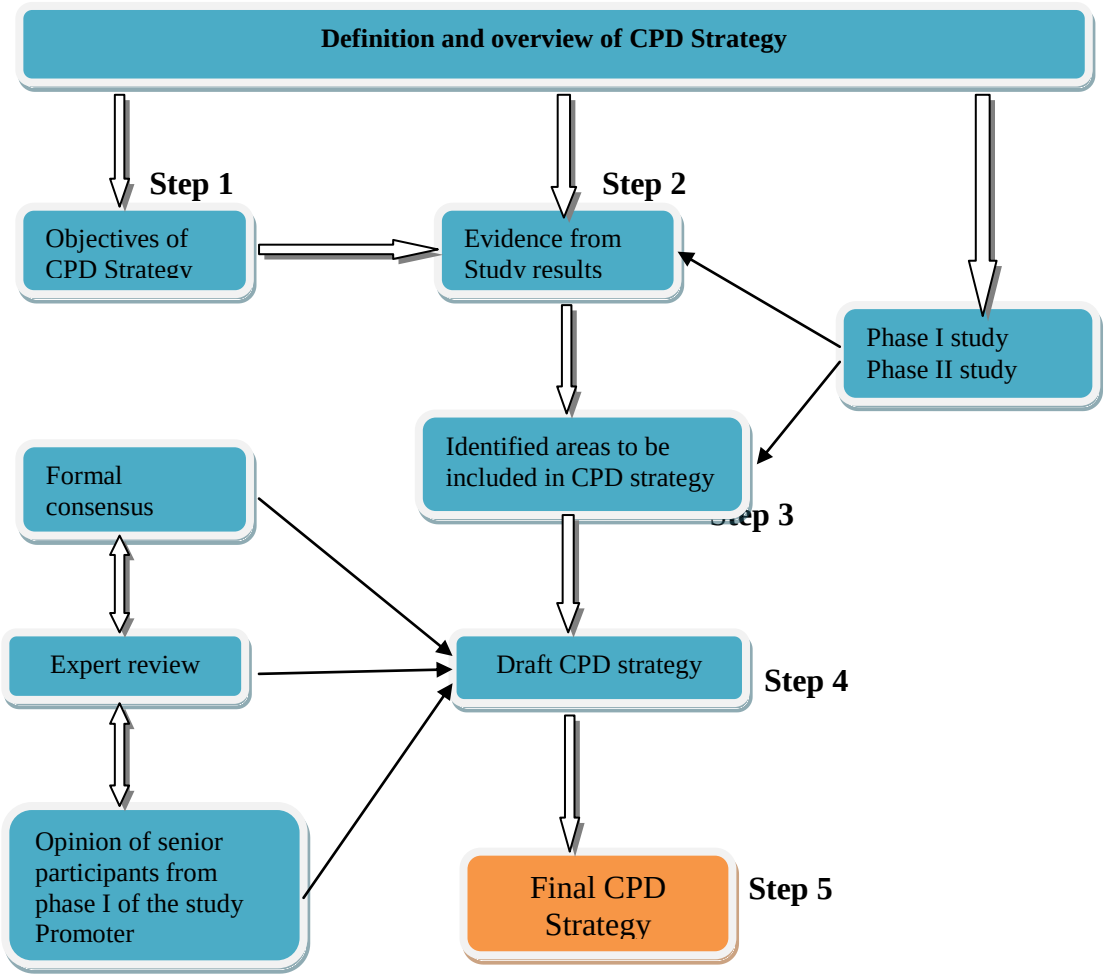

Figure 6.1 Procedure followed in the development of the CPD strategy for rural radiographers

.6.4.1 Procedure followed in developing the CPD strategy

Figure 6.1 above reflects the steps followed in the development of the CPD strategy.

Definition and overview of the CPD strategy is covered in the introduction part of section 6.4 above. Thomson and Dowding (2002:152) reveal that there are three ways to develop a strategy namely evidence linked, formal and informal consensus. For the purpose of this study, the researcher employed two methods namely evidence-linked and formal consensus. These methods also helped in the validation of the final CPD strategy. The use of consensus in the development of the CPD strategy, for instance, is based on the process of trustworthy consultation (Muller *et al* 2011:57). To this effect the opinions on the strategy was sought from experts with extensive experience in their respected areas of expertise (See Table 6.3).

Furthermore, the researcher adopted a step-by-step approach by using all the various facets of this study. The researcher revisited different but relevant areas of this mixed method study namely Phase I and Phase II results (Chapter 4 & 5). The development process of the strategy was also supported by the researchers' own experience in rural practices and guided by the study supervisor.

6.4.1.1 Step 1: Objectives of the CPD strategy

The objectives of the CPD strategy proposal are to:

- provide CPD activities that are intended to improve competencies that have been identified as important for rural radiographers but are lacking in the audited curriculum.
- provide CPD activities that will benefit both the service provider and service user namely the radiographer and the patient.
- supplement core competencies obtained upon graduation with competencies needed for rural radiographic practice.

Based on the study results, the CPD strategy was systematically developed with a purpose of providing direction to rural radiographers' professional development.

6.4.1.2 Step 2: Evidence from the study results of Phase I and Phase II

The results of this study suggest that the majority of the respondents 42.6% (n=43)

reported that the CPD seminars/workshop do not include topics that are relevant to rural radiographic practice (Table 5.40). This claim is supported by evidence from Phase I where one participant had this to say with regard to the relevance of the CPD activities;

> *''I think those people who are involved in the CPD programing do not know what should be included in the CPD to cater for rural radiographers.''*

According to the results of Phase I, another participant wondered whether those who were responsible for developing CPD activities were familiar with rural radiographers' needs. This assertion may be an indication that the team that is currently involved in designing and implementation of these CPD activities may be urban biased. If this is the case, then it raises the question as to whether they can be sufficiently knowledgeable to design multifaceted activities that can meet the needs of all radiographers including those working in rural areas of South Africa. This situation reinforces the notion that the current CPD approach may have failed and needs to be modified to meet the varying aspirations of rural radiographers (Sim 2010:5).

It also emerged from the study that the majority of the respondents 41.6% (n=42) strongly agreed that they attend CPD seminars just to accumulate points while 29.7% (n=30) of the respondents agreed that they attend CPD seminar for points only. These results suggest that the majority of respondents 41.6% (n=42) attend CPD activities only to accumulate points so as to maintain their professional registration with HPCSA. This attitude towards CPD activities might have implications on the overall quality of rural diagnostic imaging. On the other hand this negative attitude by rural radiographers towards CPD activities may be linked to the fact that most of the topics covered in these seminars are not aligned to the demands of rural radiographic practice and as such making rural radiographers to develop less interest.

The results of this study further reveal that rural radiographers need to keep updated about the technological advances and other changes that may impact the profession. For instance the results show that digital imaging (n=88; 80.7%) was ranked among the highest topics that respondents suggested that it could be included in future CPD activities (refer to Table 5.4). This however needs to be incorporated in the CPD

activities which are sensitive to the needs of the working environment. This, therefore, means that there should be a paradigm shift towards a CPD plan that takes into account the competency developmental needs of those working in rural hospitals. Such CPD programmes would be relevant to rural radiographers and the environment in which they work.

The study also revealed that rural radiographers' practice was broad and transcends the boundaries of traditional radiographic duties. However, the respondents were of the view that the current scope of practice of radiography is limiting when it comes to rural practice. The majority of the respondents 58.6% (n=61) expressed concern that the current scope of practice limits the role of rural radiographers in the caring of patients. It is important that rural radiographers are responsive to the health needs of the communities they serve. This implies that CPD activities for rural radiographers must be viewed from a broader perspective that includes the personal, social, health system and political aspects of rural healthcare (Fleet *et al* 2008:15).

The study results demonstrate that there is limited understanding of what should constitute CPD activities for rural radiographers. As a result, development of important and formal CPD activities that are responsive to rural radiography needs are often overlooked.

6.4.1.2.1 Barriers to CPD activities in rural areas

Participants in Phase I of the study bemoaned the lack of support by rural hospitals for the radiographers' to attend CPD activities.

> *''…the medical manager will tell you that you are just going for CPD points so we are not going to give you transport.''*

The present mixed methods study reveals that rural radiographers are faced with a wide range of barriers that may hinder them from accessing CPD activities (Table 5.42 – 5.46). The study results indicate that more than half of the surveyed respondents 54.6% (n=55) reported that rural hospitals do not provide support for radiographers to attended CPD seminars. This evidence is consistent with other studies which revealed that it was more likely difficult to access CPD events such as

seminars or other academic gatherings by rural health professionals (Kawooya (2012:4). Even though this study shows that rural radiographers are not supported by hospitals towards CPD activities some researchers such as Hurme (2007:9) have argued that the hospital has the responsibility to foster competency among its employees including radiographers.

The distance to which CPD activities are held also emerged as a barrier to rural radiographers attending CPD seminar/workshops. This barrier was highlighted in both phases of this study. With regard to distance one participant said;

> *''they always do them in Durban or Pietermaritzburg and we don't have time to go there.''*

This, to an extent, is a statement of frustration. The rural radiographers are saying that they want to attend CPD seminars but distance prevents them. These results are congruent with Gawugah *et al*'s (2011:333) contention that a place where CPD workshops/seminars are held is likely to cause loss of interest by many healthcare professionals. Apart from distance, the study revealed that shortage of staff in rural areas was also a barrier. It was revealed that it was not possible for a rural radiographer, who may be alone in the x-ray department, to attend the CPD event.

6.4.1.2.2 Suggestions to be considered during the development of a CPD strategy

Suggestions as to what the proposed CPD strategy for rural radiographers should encompass were sought from the study respondents using four items under section C of the questionnaire. The respondents suggested that the CPD strategy should consider including CPD activities that take into account the gap between theory and the actual practice and the needs of rural radiography. It was revealed that the study participants would favour the idea where each health district was responsible for their own CPD activities (refer to Table 5.47). These findings are consistent with the DoH's HRH strategy which also argues for the development of a system to support CPD programme in each rural district (DoH 2011:125).

6.4.1.3 Step 3: Identified areas to be included in the CPD strategy

Identified areas to be include in the CPD strategy emanated from the results of data analysis of the two study strands. Table 6.2 presents a summary of some of the gaps that the study identified and possible remedial actions that may be included in the CPD strategy proposal for rural radiographers.

Table 6.2 Areas included in the CPD strategy

Element	Gaps identified from the study	Possible remedial actions to be included in proposed CPD strategy
CPD Structure	Lack of support by hospitals Shortage of staff No local CPD programme coordinators Lack of involvement of stakeholders Impact of CPD not assessed	• Appoint/create positions for CPD programme coordinators to be based in each rural health district. • Coordinators to ensure that CPD activities program is available well in advance so that the radiographers may have time to plan • Organise both formal and informal CPD activities related to ones' work environment • Involve stakeholders (e.g. doctors, HR, PHC supervisors and many more). • Include mechanism of evaluating the impact of the CPD activities.
CPD activities Unmet CPD needs for rural radiographers	Most CPD activities not aligned to rural radiographers' competency needs. Available CPD activities mainly address the needs of radiographers working in urban environment	• **CPD needs assessment:** Seek the opinion of rural radiographers' on topics/areas to be included in CPD activities • Include in CPD activities topics of general interest such as those identified in the current study • Identify rural radiographers' unmet needs (competencies) that can be addressed through CPD activities and include them in the CPD plan • Grant currency not just with current or recent rural practice but also include current technologies in radiography
CPD venues	Distance to CPD venues	• Localise and register CPD activities (e.g. Combine 5 hospitals) • Rotate CPD venues to include rural areas • With the availability of computers in almost all x-ray departments introduction of online CPD activities. maybe considered

6.4.1.4 Step 4: Draft CPD strategy and the validation process

After gathering the evidence from the study together with suggestions that were made by study participants in Phase I and respondents in Phase II, the researcher developed a draft CPD strategy proposal (Annexure X). The rationale for developing the draft CPD strategy was to bring out the critical areas that emerged from the study

to the focus of reviewers, expert evaluators and the study supervisor.

The validation process began with the researcher who then sought validation among experts. The draft CPD strategy was circulated for the expert review which included one senior doctor with more than 15 years of rural experience, one radiography manager, two radiographer and two from the academia. Opinion on the draft was also sought from one senior participant from Phase I study and the study supervisor. All the evaluators were purposely selected. This was done to secure wider representation from the clinical staff and the academics. Table 6.3 represents evaluators' demographic information.

Table 6.3 Demographic information of expert evaluators of the draft CPD strategy

No.	Profession	Qualifications	Work Experience
1	Medical Doctor (District physician)	MBChB, MPH	15+ years
2	Assistant Director: Radiographer	Bachelor of Technology: Radiography.	20 years
3	Chief Radiographer Grade 1	Diploma in diagnostic radiography	10 years
4	Radiographer Grade 3	Diploma in diagnostic radiography	23 years
5	Academic lecturer (radiography)	Dip. Rad (D), Msc Ultrasound, D. Tech. Radiography	18 years
6	Academic lecturer (radiography)	M. Tech. Radiography	9 years

The criteria that was used for evaluation was developed with a Likert scale scoring based on a four-point scale namely 1- strongly disagree, 2 – disagree, 3 – agree and 4 – strongly (Annexure XI). The evaluation criteria and the draft CPD strategy were emailed to the evaluators. The researcher requested the evaluators to use the scale and score accordingly if the draft CPD strategy meets the criteria. Evaluators were also requested to provide suggestions and comments where necessary. Undertaking the validation process was an attempt by the researcher to improve the validity of the CPD strategy and also add to the quality of the strategy.

6.4.2 Feedback from evaluators

Feedback was received from five evaluators. One evaluator did not respond to the request. Results of the other five evaluators which were taken into consideration when developing the final CPD strategy proposal are reflected in Table 6.4 below.

Table 6.4 Results of the evaluation by evaluators of the draft CPD strategy

Criteria	1	2	3	4	Mode	Total
Credibility: The CPD strategy is credible and can be trusted to deliver what it is intended to deliver	2 40.0%	0 0.0%	3 60.0%	0 0.0%	3	5 100%
Relevance: This CPD strategy is appropriate for the target group (rural radiographers)	0 0.0%	0 0.0%	2 40.0%	3 60.%	4	5 100%
Reliability: The CPD strategy can be used consistently by rural radiographers	0 0.0%	3 60.0%	1 20.0%	1 20.0%	2	5 100%
Implementable: The CPD strategy can be implemented	0 0.0%	1 20.0%	0 0.0%	4 80.0%	4	5 100%
Clarity: The CPD strategy is easy, simple and understandable	1 20.0%	2 40.0%	1 20.0%	1 20.0%	2	5 100%
Sustainability: In its current form the CPD strategy is sustainable	1 20.0%	2 40.0%	2 40.0%	0 0.0%	2,3	5 100%
Flexibility: The CPD strategy allow flexibility in its applications and thus can be adjusted to suit the needs.	0 0.0%	0 0.0%	3 60.0%	2 40.0%	3	5 100%

Results in the above table show that evaluators were consistent in their scoring. This is reflected in the modal score column. However, there were also notable criteria that received low rating by evaluators namely clarity and reliability and needed attention. On clarity, most evaluators noted that the diagrammatic representation of the draft strategy was not clear. Changes were made to the diagrammatic representation of the final CPD strategy such as consolidating of subcomponents and grouping main components into steps (Figure 6.2). Evaluators also mentioned that the description of some of the steps of the strategy namely step 4 was not clear and needed revision. Based on the opinions of expert evaluators, the researcher and the study supervisor decided to use less text in the description of the steps of the final CPD strategy. This was done to increase clarity and easy to read.

Evaluators also did not agree that the strategy was reliable. Some of the comments from those who did not agree related to non-representation of radiographers in broader management levels. They raised a concern that it may be difficult for the programme to succeed if management is not brought on board from the beginning. Evaluators argued that this can only be achieved if there was representation. This limitation is however addressed by including hospital management as part of the stakeholders,

The other area of the draft CPD strategy that received low rating was sustainability.

Evaluators were equally divided on this criterion. The evaluators who did not agree were of the view that there was financial implication for hosting CPD seminars and the strategy did not articulate clearly where funding would come from or how the funds would be raised. These and other observations and comments by expert evaluators were taken into account when the final CPD strategy for radiographers working in rural areas of South Africa was drafted (Figure 6.2). For instance, in the final strategy it was proposed that non-governmental organisations and companies that supply hospitals with x-ray accessories could be approached for sponsorship as part of their social responsibilities. Furthermore, it is mentioned in the final strategy that local facilitators may be used instead of bringing in facilitators from outside.

6.5 THE FINAL CPD STRATEGY PROPOSAL

Step 5 of Figure 6.1 is the last step in the process of developing the strategy. Step 5 thus deals with the final CPD strategy proposal. As indicated in section 6.4.2 above, the final CPD strategy for rural radiographers (Figure 6.2) was consolidated after receiving the feedback from the evaluators. The CPD strategy incorporates the key values identified in the study and opinions from the evaluators. It is suggested that for the CPD strategy to be successfully implemented a process guided by both the main and sub- components must be fulfilled. The main components of the strategy include:

- Structure of the CPD strategy
- CPD Strategy aims and objectives,
- CPD needs assessment
- Designing appropriate and relevant CPD activities
- Accreditation of CPD activities - credibility
- Identifying geographically accessible CPD venues
- Implementing CPD activities
- Evaluation of outcomes of the process and feedback

These main components which are represented by steps 1 to 7 are supported by subcomponents namely stakeholders, local CPD coordinator/s, sustainability and success. These components and subcomponents of the CPD strategy will be explained in more detail to show how the CPD strategy can be implemented and also how it may contribute to the improvement of rural radiographers' additional

competencies that may not have been obtained at graduation.

6.5.1 Structure of the CPD strategy

The dynamism of rural radiographic practice provides for a CPD strategy that will help keep pace with the ever changing work environment. This, however, requires a CPD strategy as a structure which provides clear guidelines. This CPD strategy (Figure 6.2) is based on a supportive structure that relies on the use of broad stakeholders' participation and existing expertise within the radiography profession. Regardless of how the CPD strategy is implemented, the use of the strategy involves

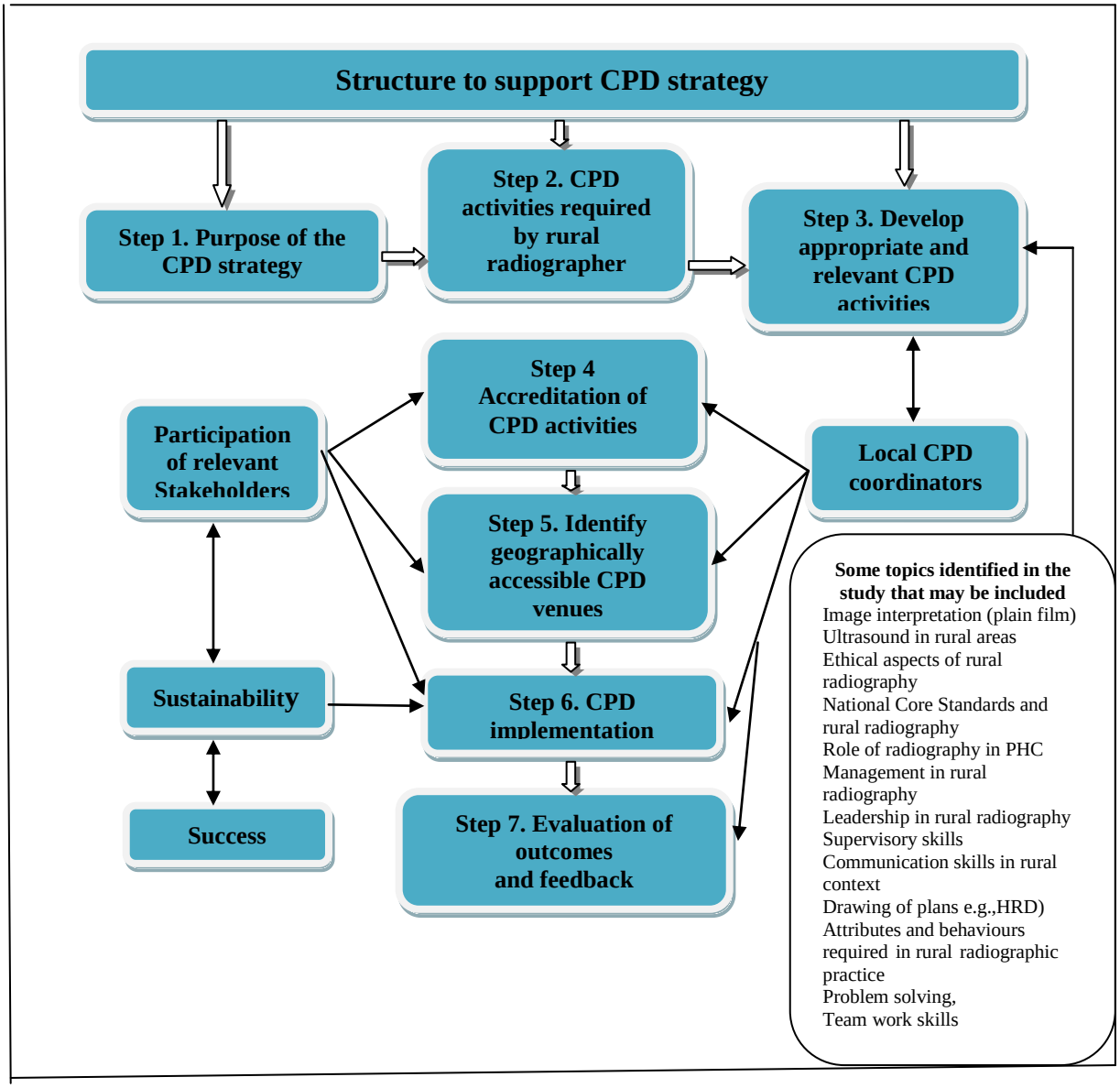

Figure 6.2 Diagrammatic presentation of the final CPD strategy for rural radiographers

seven steps. Figure 6.2 above shows that the diagrammatic presentation of the proposed CPD strategy that may be used to deliver CPD activities for rural radiographers

6.5.1.1 Step 1: Purpose of the CPD strategy

The purpose of this CPD strategy is to provide a plan that can be used to deliver CPD activities that are directed at maintaining and updating rural radiographer's competencies, many of which may not have been acquired during the pre-service training, as evidenced in the audited curriculum above. Besides, Smith and Fisher (2011:11) concluded that the purpose of continuous educational development is to improve patient outcome by improving clinical practice.

6.5.1.2 Step 2: CPD activities required by rural radiographers.

Step 2 of the strategy deals with the activities done to identify appropriate CPD activities required by rural radiographers. In order to achieve this, the following should be done:

- Conduct a CPD needs-assessment for rural radiographers
- During CPD needs assessment solicit input from rural radiographers
- Some of the methods that maybe used in the needs assessment include, but are not limited to;
    - asking the rural radiographers to identify topics/competency areas in which they may be interested (refer to Table 5.48),
    - approaching other health professionals who work closely with radiographers and other experts to identify deficiencies in the practice of rural radiography.
    - conduct general audit of rural radiographic practice
    - asking diagnostic imaging services consumers on what suggestions they have that can help improve the service.
- Use the results of CPD needs-assessment as a departure point in the process of developing CPD activities that are appropriate and aligned to rural competency needs.

6.5.1.3 Step 3: Develop appropriate and relevant CPD activities

Evidence from the study suggests that due to the diverse nature of rural radiographic practice, radiographers need to be constantly updated in a number of competency areas. This breadth of learning needs, according to Rødahl *et al* (2011:9) can be met by using CPD activities as a catalyst. Step 3 of the CPD strategy attempts to narrow the gap between theory and practice by suggesting topics/guidelines that can be used in the context of rural radiography practice.

- Based on the CPD needs assessment, input from rural radiographers and the support of stakeholders, design or develop CPD activities that are appropriate and relevant to the needs of rural radiographers. In the same vein Cooke *et al* 2013:114) noted that appropriate and locally based CPD activities were an important factor in the retention of health professionals.
- Those at the forefront of developing these CPD activities must ensure, among other things, that such activities keep pace with modern practice which must be linked to the responsibilities that rural radiographers may be assigned to.
- Must be aware that most of the competencies that rural radiographers need to be updated are generally generic (Table 5.48). But what is clear is that there is usually limited incorporation, in the current CPD activities, of what constitutes rural radiographic practice and its' required competencies. In other words, there is less emphasis on generic competency areas.
- Insist on developing CPD activities that are appropriate and aligned to the needs of the broader rural working environment.
- Ensure that rural radiographers and relevant stakeholders such as doctors, SORSA and other non-health professionals who work in collaboration with rural radiographers are involved in the development of CPD activities.
- Consider the results of the study which shows that, other than clinical radiographic competencies, radiographers need to be updated in generic competencies such as leadership, management, teamwork, planning, ethical aspects of rural radiography, attributes and behaviours and many more. This is also consistent with Fleet *et al's* (2008:15) suggestion that CPD activities for rural health professionals must be considered from a broader context that include personal, social, health system and political aspect of rural healthcare.

It must however be stressed that CPD activities should address the specific needs of radiographers operating in rural areas, but also including activities that will keep rural radiographers up to date with what is happening in the modern context.

6.5.1.4 Step 4: Accreditation of CPD activities

The strategy is developed on the basis of empirical evidence and a process of validation by experts and other interested parties.

- To ensure credibility of the CPD activities, register with relevant accrediting authorities and also involve SoRSA.
- Provide a positive collaborative atmosphere with stakeholders to build on existing expertise, and to facilitate links to experts.
- Ensure that development and implementation of a system makes it easy for the target group (rural radiographers) to access current, relevant and reliable information that is biased towards the competency needs of rural radiographic practice.

6.5.1.5 Step 5: Identify geographically accessible CPD venues

Results show that rural radiographers are discouraged from attending CPD seminars because of distance. In order to address this challenge, the CPD strategy proposes the following:

- The local CPD programme coordinator may be given responsibilities to liaise with radiographers in order to come up with a consensus on the suitable venue for all participants.
- A chosen venue must be within a reasonable distance to all participants.
- CPD programme coordinator may also encourage the introduction of in-house CPD activities and also the use of online activities.

6.5.1.6 Step 6: Implementation of the CPD strategy

The implementation stage will require concerted effort by all rural radiographers and relevant stakeholders. Cooperation between a range of stakeholders is important to ensure success of the implementation process.

While the CPD strategy has been developed to address a number of competencies that rural radiographers may require or may need to develop during the course of their practice, some may be more applicable to individual rural areas than others. Based on this, it is suggested that CPD coordinators or any other person may either use the strategy in its entirety or just focus on relevant sections that may be applicable to their context.

6.5.1.7 Step 7: Evaluation of outcomes and feedback

The last stage of the CPD strategy deals with evaluation of outcomes. Muller (2002:102) describes outcome as the end results obtained at the end of the implementation and completion of the process.

- Conduct audit of the strategy to assess whether the strategy was able to meet its objectives.
- The audit can be done yearly or any other interval/period that may be deemed appropriate by the radiographers themselves and stakeholders.
- Use cost effective audit methods. For example, the audit may be done as a simple survey and can be conducted by a local CPD programme coordinator.
- Evaluation to serve as a basis for re-planning.

6.5.2 Subcomponents of the CPD structure

The following subcomponents of the structure of the CPD strategy are equally important for the successful implementation of the strategy.

6.5.2.1 Participation of relevant stakeholders

This CPD strategy provides for stakeholders' participation in the process of rural CPD activities in various steps as indicated in figure 6.2. It calls for collaboration between and among the relevant stakeholders. The stakeholders might include, but are not limited to;

- Provincial department of health
- District health officials
- Rural hospital managers

- Other rural health professionals such as medical managers, doctors, and other health professionals
- Organisations such as Rural Doctors Association of South Africa (RuDASA) HPCSA, SoRSA
- Non-governmental organizations such as Umthombo Youth Development (UYD)
- Radiography training institutions
- Representatives from non-clinical disciplines such as HR, Supply chain management (SCM), finance, Employment Assistance Programme (EAP) and many more.

Collaboration with these stakeholders can be at any stage of the CPD strategy namely; formulation of CPD objectives, development of CPD activities, or stakeholders may come in as sponsors of CPD seminars, facilitators and or accreditations of CPD activities. It must be noted that inclusion of stakeholders is inherently reflected in the competency framework that guided this study (Fig. 1.1). It also reinforces the concept, as reflected in the RRCF, that rural radiography cannot be practiced in isolation and thus rural radiographers must embrace the collaborative nature of rural health care services.

6.5.2.2 Local CPD programme coordinators

It is proposed that a CPD coordinator may be appointed and be stationed at each health district office. The strategy attempts to bridge the gap and afford opportunities to all to participate and contribute towards meaningful CPD activities. This will require the following:

- The CPD strategy proposes that each rural health district should have a dedicated CPD programme coordinator/s on a voluntary basis.
- These coordinators must spearhead the CPD programmes in the district.
- CPD coordinators will have the responsibility of arranging venues and liaising with authorities and relevant stakeholders on behalf their rural counterparts.
- The rural health district coordinator should also participant in step 3 of the strategy which is deals with the development of appropriate CPD activities.

Moreover, a similar approach was adopted in Eastern Cape Province in 2010 and by June 2011, according to Cooke *et al* (2011:113), more than 16 fully accredited CPD activities had been undertaken.

6.5.2.3 Sustainability of the CPD strategy

Sustainability, in the context of the present study and the CPD strategy in particular, refers to the capacity of the proposal to endure. It was therefore important to incorporate in the strategy sustainability mechanisms as part of the structure of the CPD strategy. Sustainability of the CPD strategy depends on the availability of the required resources, such as funds for workshops/seminars, facilities and other logistics. The following could be used to ensure sustainability:

- Consider alternative funding which may include approaching companies that supply x-ray equipment and accessories for sponsorship.
- Link up with NGOs such as those who provide scholarship for rural health professionals like UYD since they allocate funds for post graduate support.
- Invite other health professionals such as doctors, HR practitioners, PHC supervisors and other relevant stakeholders to do presentations on topics that may have an impact on radiographic practice. The assumption is that if CPD activities are organised locally one is likely to get the services of some of these professionals at no cost. This is one of the rationales for including stakeholders in the structure of the strategy.

6.5.2.4 Success of the CPD strategy

The success of the strategy depends on an attempt to design and develop CPD activities that are inclusive, relevant and tailored to the needs of the target group namely rural radiographers. The strategy is not designed to delink rural radiographers from any information that is related to technological advancement in diagnostic imaging. A culture of collaboration between and among relevant stakeholders must be enshrined in the strategy. The following will therefore be necessary:

- Ensure that radiographers working in rural areas develop a shared responsibility of patients' needs and expectations
- Ensure that rural radiographers feel the ownership of the programme by

involving them in every step of the process.

- The CPD strategy should not be looked at in isolation but rather at wider rural health professionals. This is because issues of multi-skilling permeate the wider health environment (White 2003:372).

6.6 REFLECTION AND CONCLUSION ON THE CPD STRATEGY

6.6.1 Reflection

Even though the proposed CPD strategy focuses on rural radiographers the researcher believes that it may have implications for and parallels to other rural healthcare professionals such as doctors, physiotherapists, Occupational Therapists, pharmacists, dental therapists, dieticians and nursing staff. This is because of its generic nature. The focus of the CPD strategy is on the competency needs of rural radiographers however the contact between this group and their urban counterparts and shared needs should always remain important. It is hoped that this could serve as an enrichment or an ‘‘eye opener’’ for the urban radiographers if they are invited to attend the rural CPD events.

6.6.2 Conclusion: CPD strategy

Considering the gaps in the competencies identified in the study and the perception of CPD activities by rural radiographers, one is bound to suggest that an altruistic approach may be required to sensitize rural radiographers on the benefits of attending CPD seminars. The researcher is of the view that this CPD strategy may be the catalyst needed for motivating rural radiographers to embrace the benefits of CPD activities in their daily practice. Accordingly, the CPD strategy could be used as a driver to change the on-going competency development for radiographers working in rural areas of South Africa. This may be achieved by further developing supportive guidelines that could be used to facilitate the implementation of this CPD strategy.

6.7 CONCLUSION ON CHAPTER 6

This chapter outlined in detail how the curriculum was audited and how the audit

results were compared with the study results. The curriculum that was audited appears to focus on minimum competencies when compared with the study results particularly with rural radiography practice. Furthermore, the chapter outlined the process that was followed in the development of the final CPD strategy proposal.

CHAPTER 7

DISCUSSIONS, LIMITATIONS AND RECOMMENDATIONS

7.1 Introduction

The contribution of general diagnostic imaging in the diagnosis and clinical management of patients in rural hospitals of South Africa is enormous. Yet it has been demonstrated empirically (in the present study) that little is known about the additional core competencies and skills required by rural radiographers who are involved in the delivery of this important service. In the same vein, published evidence revealed that the radiography profession is without defined guidelines as to the nature of competencies (Pratt 2005:22). Despite this existing gap, the available studies have focused more attention primarily on other rural health professionals such as doctors and nurses. The aim of this mixed methods research was to investigate and identify additional core competencies required by radiographers working in rural district hospitals of KZN in order to propose a CPD strategy for rural radiographers.

Accordingly, four objectives were identified in an attempt to meet the study aim. These objectives were as follows:

- Investigate and identify additional core competencies required by the rural radiographic workforce.
- Identify the challenges that rural radiographers face in the execution of their duties.
- Analyse a curriculum of a training school for radiography in KZN and compare study results to determine the competencies that may not have been included in the curriculum. This objective has been addressed in Chapter 6.
- Propose a CPD strategy for rural radiographers based on the results of the study. This objective have also been addressed in Chapter 6

This study was large in scope and complexity encompassing two different data collection phases. The results from the first phase directly influenced what the

researcher included in the data collection instrument for the second phase. Thus the study was based on a mixed methods approach research, following the sequential exploratory design. The two-strand construction (represented in Figure 3.1) afforded this researcher the opportunity to draw on the strength of qualitative interviews to explore and the strength of quantitative surveys to systematically investigate the additional core competencies needed by radiographers working in rural areas of South Africa (Bankins 2011:357).

7.2 STUDY FINDINGS

The results from both phases of this study revealed that radiographers working in rural areas were confronted with a variety of challenges and responsibilities that require a broad range of skills and competencies. There are a number of additional core competencies that have been identified by this study which appear to distinguish rural radiography practice from the one practiced in big urban hospitals. Other than lack of additional competencies required by radiographers working in rural areas, the study also revealed a number of challenges that are faced by radiographers.

The following subsections bring together the main findings of the study and the researcher's discussion of the findings and implications with regard to rural radiographers.

7.2.1 Additional competencies required by rural radiographers

The results of the study revealed that radiographers working in rural areas were expected to carry out a variety of responsibilities that require a broad range of competencies. The study also has shown that rural radiographers, even without extra competency development, undertake a broad range of simple and complex duties during the course of their practice. Evidence from this study also reflects non-clinical competencies that radiographers may be expected to develop while working in rural areas. Thus, the study findings suggest that radiographers working in rural hospitals of South Africa need to develop personal attributes, behaviours and capacities that may not have been acquired during the pre-service training but are essential for rural practice.

7.2.1.1 Ability to work in a multi-disciplinary team

The findings of this study indicate that one's ability to work well within the multidisciplinary team was an important competency in rural hospitals. Participants in the focus group and the respondents in the survey all agreed that team work in rural hospitals was essential.

''The bottom line is that we need each other'' said one participant.

This is consistent with the observation of a community service medical officer who noted that the culture of team work and co-dependence of healthcare workers in rural hospitals is one thing that lacks in urban context (Perumal 2012:355). However, the study also reveals that there were reservations that collaboration of radiographers with other team members especially doctors may be tainted by the lack of respect. The majority of respondents 38.5% (n-42) reported that doctors as members of the team do not respect radiography policies and guidelines.

The evidence emerging from this study suggests that rural radiographers need to be equipped with skills and develop competencies that are beyond those of established 'traditional radiographic boundaries.' The functioning of a rural healthcare team requires collaboration among different healthcare workers. Lack of respect by other health professionals may possibly be indicative of lack of rural radiographer's leadership within the rural health team. This, then demands changes to the established radiographic competencies to include other clinical and generic competencies which radiographers may not have attained during a pre-service training but are likely to enhance integration into a larger rural health care team.

7.2.1.2 Attitudes and behaviours for rural radiographers

Evidence from this study indicate that even though the technical competencies remain the core function of radiography, radiographers working in rural hospitals of South Africa are expected to develop good working relationship with every patient no matter how short the encounter may be with the individual patient. Understanding of the cultural beliefs of rural patients can be valuable in meeting their needs with regard to diagnostic imaging.

7.2.1.3 Communication in rural areas

Just like in any other organisation, communication was identified as an important core competency needed in rural areas. The study shows that communication in rural area becomes even more important and difficulty at the same time because of low education levels and also the cultural beliefs among rural patients.

> *''...we need to communicate to our patients a bit different. ''...what I mean is that we need to come down to their level of education and be able to explain in a simple language which they can understand.''*

It is evident from the study results that rural radiographers are expected to employ appropriate language which is suitable to the recipient of the message, in this case rural patients. In the same way, Chris (2004:4) explains that the foundation of good relation in cultural consultancy was the ability of the healthcare professional to convey sensible messages to the patient. Equipping rural radiographers with the skill to communicate effectively will not only be beneficial to the patient but also to other members of the rural health team.

7.2.1.4 Rural radiography and leadership

Leadership might be one of the competencies which traditionally may not be associated with radiography but it is unique to rural radiographic practice and represents an additional responsibility and technical competency. Yet, Hardy and Snaith (2006:328) state that rural leadership responsibilities are beyond those expected at the point of graduation. This is true when one compares the results of the audited curriculum which made no mention of leadership as a competency (Table 6.1). Nevertheless, those leading radiography in rural hospitals, just as in other organisation, must influence those they lead towards healthcare success. This study found that rural radiography practice requires managers who should provide leadership whose impact on radiographic service is evident (Table 5.21). Evidence from this study further revealed that a lack of support from hospital management was a barrier to one being a good rural radiography leader. This lack of support by senior hospital management was bound to aggravate the fact that graduate radiographers lack appropriate competencies in the context rural radiographic practice (Lehman &

Makhanya 2005:139). This brings to the fore the fact that there is a need for good and sound rural radiography leadership with the support of senior hospital management. It is also important that leadership concept is introduced early in the radiographers' educational development (Longgrove & Long 2012:230).

7.2.1.5 Rural radiography and management

The study found that it was essential to reinforce management skills by integrating practice and theory very well (Table 6.1). For instance, the evidence from the study shows that respondents were equally divided on the issue of budgetary control. Those that agreed that they were aware of budgetary control as related to an x-ray unit were equal to the number of respondents (n=34; 31.5%) who disagreed. It is important that rural radiographic managers take cognisance that every decision made must ensure equitable delivery of radiographic services. This was necessary because in many instances rural radiography in particular and rural healthcare in general was practiced in the context of numerous and significant challenges such as budgetary and resource constraints. Results of this study also revealed that less attention was paid to the competency developmental needs of rural radiography managers.

7.2.1.6 Ethics in rural radiography

Ethical practice in rural radiography was one of the areas that were revealed as being important. Rural radiographers ought to be aware that they need to be sensitive to the cultural beliefs of rural patients and need to respect patient privacy and confidentiality. The study found that other than doctors requesting the opinion of radiographers on x-ray images rural patients also ask radiographers to tell them what was wrong with them after the x-ray has been taken (subsection 4.2.3.6.2). It is evident from the study that without being aware of ethical principles rural radiographers found themselves in a dilemma (subsection 4.2.3.6.2) as to how to respond to these requests.

7.2.2 Appropriate competencies for radiographers to support PHC

The role of radiographers in the DHS system based on PHC appears to be complex

and challenging but if they were fully prepared during pre-service training these radiographers can manage these challenges. It is evident from the present study that this is not the case. The findings are consistent with Thulo (2006:102) who also found that it was important for clinical staff, in this case rural radiographers, to be aware of PHC and lifelong learning. Some of the competencies that emerged from the study, as essential in the provision of quality radiographic services in PHC, are discussed in the following subsections below.

7.2.2.1 Clinical Skills: Ability to do basic assessment of patients' affected area.

Limited clinical examination and assessment of the affected area might be beyond the scope of radiography but participants' views and respondents' opinions suggest that it is an additional core competency that is required in rural areas (Subsection 4.2.4.2.1 and Table 5.32 respectively). Currently there is no legal barrier to extending the scope of radiographic practice in this aspect. By embracing basic assessment skills of the affected area, rural radiographers would be contributing to the quality of patients care. This may especially be the case with trauma patients. If radiographers could be developed in this competency area, there was likely to be a reduction in the number of incidents where a radiographer x-rays a wrong part, which entails repeating of an x-ray examination. A number of implications are associated with repeats namely unnecessary radiation exposure to the patient and waste of resources. Comparable evidence from published literature suggests that having assessment skills may help radiographers to justify additional x-ray examinations based on the information obtained from the patient (Snaith & Lancaster 2008:151). This study therefore shows that primary assessment no matter how basic it may be is part of knowledge and skills needed by rural radiographers to perform more effectively.

7.2.2.2 Clinical skills: Interpretation of plain x-ray films

Despite various opinions regarding the interpretation of conventional x-ray images by radiographers on a regular basis, it is now evident that radiographers do give opinions within the context of rural hospitals. Results of this study found that rural radiographers consider interpretation or reading of conventional x-ray images as a desired attribute that they should be skilled in (Tables 5.31 and 5.39). The ability to

interpret basic skeletal radiographs may enable the rural radiographers to initiate further projections. In the same vein Howard (2013:137 and Hardy *et al* (2010:29) also noted that interpretation of radiographs is a core competency that would increase the ability of rural radiographers to further provide quality imaging services. Moreover, it will help rural radiographers adjust to the needs of rural healthcare and thereby enhance diagnostic outcomes for patients. On the other hand, reporting on skeletal x-rays by rural radiographers as suggested above entails an extended role for rural radiographers. This extended role however has never been recognised and as such training has never been expanded to include such competencies.

Based on the results of the present study, it is evident that interpretation of conventional (plain) radiographs must be one of the additional core competencies that radiographers working rural hospitals of South Africa need to possess. Research has shown that misinterpretation of radiographs by non-radiologists but trained medical doctors was the most common type of clinical error in casualty departments (Smith *et al* 2009:2; Berman *et al* 1985:421). A recent study of about 40 radiographers from the UK who completed an accredited postgraduate certificate programme showed that they were able to interpret a broad range of adult chest x-rays with a satisfactory accuracy (Piper *et al* 2014:98).

7.2.2.3 Clinical skills: Ultrasound scanning by diagnostic radiographers

Despite the on-going battle of HPCSA not allowing diagnostic radiographers to perform such duties as contrast injection, reporting on accident and emergency films or ultrasound scans (Louw 2015:7; Munro *et al* 2012:27), evidence from this study reveal that diagnostic radiographers perform ultrasound scans within the context of rural hospitals and this demonstrates a preference by rural radiographers to being truthful (Tables 5.31, 5.33 and 5.34). Being truthful, in this case, refers to respondents being honest in reporting that they were doing ultrasound scans. This means that the rural radiographer's professional borders continue to fade influenced by factors such as skills shortage and work environment. Equally, Thulo (2006:29) noted that due to the shortage of radiologists especially in rural areas, radiographers take up roles which include ultrasound, report writing and administration of intravenous contrast. The evidence from this study points to an existing potential for

increased competency extension within the existing group of rural diagnostic radiographers and a better preparation for them to meet new and emerging responsibilities. These results are consistent with the study done by Moran and Warren-Forward (2011:272) on the assessment of role extension which found that the majority of radiographers (76%) were prepared to undertake additional responsibilities as long as there was training to increase knowledge and skills base.

Clearly, ultrasound scanning is beyond the scope of diagnostic radiography training but in the context of rural setting where there is a shortage of sonographers and radiologists, equipping radiographers with such a skill will aid in the management of patients. Similarly, White (2003:iv) reported that 80.6% of radiographers who took part in the study conducted in Hong Kong were of the opinion that a multi-competent radiographer was more valuable than a single specialty radiographer. Due to shortage of doctors, for instance, PHC nurses assume responsibilities which were not part of nursing knowledge or expertise (Pearson 1993:216). .

7.2.2.4 Introduction of outreach programmes

Both research participants and respondents suggested for the introduction of outreach programmes to provide ultrasound services to the clinics. Floating an ideal like this one borders on critical thinking (Subsection 4.2.4.2.2 and Table 5.36 respectively) which according to Turner (2005:48) is the ability to change status quo and be able to make available remedial steps to improve it. Even though this kind of thinking may be classified as an additional core competency needed by rural radiographers it appears to be missing in the audited radiography curriculum (Table 6.1). Regardless of this challenge, the empirical evidence from this study reveals that rural radiographers have identified the problem and are being proactive in suggesting a solution. Moreover, the study shows that radiographers were willing to use the outreach services not only for diagnostic imaging services purposes but also as a platform to disseminate information about x-rays (Table 5.36).

> *''…we are in PHC so we can take this service nearer to where patients stay. We can use portable ultrasound machines.''.*

The evidence reveals that rural radiographers are members of the community and as

such have an important public health role to play which may include health education. Similarly a study conducted in rural Australia on psychologists showed that being proactive and willing to step outside one's comfort zone was considered important (Sutherland & Chur-Hansen 2014:275).

It is evident from the study results as discussed above that rural radiography in reality goes beyond the traditional technical and clinical competencies acquired during the pre-service training. The findings of this suggest that rural radiographers require a two-fold competency development namely competency extension which occurs within the scope of radiography and competency expansion which occurs outside radiography. The challenge is that some of the required developments in the competency extension such as ultrasound scanning, reading of x-rays and administration of intravenous contrast by radiographers have not yet been legislated and as such might face resistance from professional board. However, it is the needs of rural patients that should be at the centre. This, according to Cooke *et al* (2011:114) requires that stakeholders look beyond professional boundaries.

7.2.3 Challenges encountered in rural radiographic practice

The evidence from both phases of the study revealed that radiographers working in rural areas were faced with a wide range of challenges some of which are only unique to rural radiography practice. For instance rural radiographers have to deal with unnecessary requests for x-ray examinations by healthcare staff and also be able to respond to doctor's request for their opinions on x-ray images. Other challenges that emerged from the study include unnecessary demand for x-ray examinations by rural patients and old equipment. The study results showed that these challenges were further compounded by the fact that rural radiography services were not well organised. This assertion is supported by the study results which showed that the majority of the respondents (78.9%) reported that radiographic services in rural areas were not well disorganised.

As evidenced from the results of both phases, namely Phase I and Phase II of this study, participants and respondents respectively cited lack of respect and appreciation by their counterparts especially the doctors. Lack of respect maybe the

underlying cause of the ‘‘not so good’’ relationship between rural doctors and radiographers. The relationship between rural radiographers and most doctors is characterised by resentment by radiographers. This is reflected of in one participants’ comment:

> *‘‘Rural radiographers should be taken as professionals not the way it is happening now. We need respect and to be consulted……’’*

It is generally apparent from the study results that radiographers who participated in the research struggle to adjust and adapt to rural challenges. The failure to adapt and adjust may be linked to lack of support and the absence of radiologists both of which have been identified as challenges in both strands of the study. In the same way, junior doctors who were sent to work in rural areas of Australia identified lack of support as a challenge (Smith 2005:4). In the same vein data from this study revealed that 83.5% (n-91) of the respondents reported that absence of specialists such as radiologists affect the work of radiographers. This then is likely to have a negative impact on radiographers’ self-esteem and consequently influence their long term competency development.

Most of these challenges stem from lack of adequate preparation of radiographers by training institutions for the challenges that radiographers face in PHC. This finding is consistent with Gqweta (2012:15) who also found that there was failure by training institutions to fully prepare radiographers for the challenges in PHC.

7.2.3.1 Scope of radiography practice

The study found that the more than half of the respondents 58.6% (n=61) were of the opinion that the existing scope of practice for radiography was limiting rural radiographers on the role they need to fulfil. This evidence suggests that the scope of radiography is narrow and may need to be extended. In contrast, the DoH’s HRH strategy for 2012/13 -2016/17 proposes that one should consider how the scope of work and job design for Mid-Level Worker could be adjusted through task shifting or sharing (DoH 2011:74). If this HRH strategy was considered, it was likely to accommodate the broad range of competencies required by rural radiographer. Based on this study’s results one is bound to suggest that the competencies enshrined in the

scope of radiography practice should not be rigid but flexible as different environments in which radiography is practiced may have an influence on the radiographer. Delineation and broadening the definition of rural radiographers' core competencies is bound to pave the way for expansion of responsibilities and at the same time allow for professional growth. This view is shared by the Western Australia County Health Services (2008) which argue that having standardised and common core competencies that include the necessary skills for rural radiographers have a significant reward.

Stakeholders should therefore work towards harmonising the curriculum and consequently the scope of radiography which by its nature currently and going by the results focuses on minimum competencies. Considering the evidence that has emerged from this study, it might be worthwhile to suggest that the scope of radiographic practice in rural areas should not mirror the restrictive scope associated with urban practice. This assertion is supported by Cooke, *et al* (2011:114) who also argue that the scope of practice must not impact on rural practice but must be flexible and appropriate for rural areas.

Based on these findings, it is therefore the view of this researcher that for radiographers working in rural areas, to respond to the needs of rural radiographic practice, it may be necessary to define the scope of radiography widely so as to accommodate needs and developing competencies. Duckett (2005:201) holds a similar view; namely, that adjustment is needed for health professionals working in rural areas to change and respond to the epidemiological and demographic transition of the rural population.

7.2.4 Radiography training and rural practice

The study results reveal that there is a gap between the skills acquired during training and the practical skills needed for rural practice. The majority namely 63.3% (n=69) of the respondent strongly disagreed or just disagreed that the curriculum provides for rural exposure of student to rural setting during training. The study also found that the training did not equip graduate radiographers for the demands of rural radiographic practice. These results have an implication in that most radiographers

working in rural areas may lack the diversity of competencies that are required to cope with the demands of rural radiography practice. Similarly, participants who took part in a study conducted by Smith (2005:4) also mentioned that there was limitation in the training provided to prepare and support medical practitioners in rural practice. However, in order for rural radiographic profession to grow, graduates need to be equipped with, not only traditional core radiographic skills, but also with additional competencies that are necessary.

Preparing radiographers for a rural career may be a challenging undertaking but it is a task that needs to be done if the rural hospitals are to keep radiographers. Furthermore, the continuous increase in the demand for extra responsibilities and the blurring boundaries in the duties being undertaken by rural radiographers suggest that their training need to be responsive to the demands of rural radiographic practice in order to meet the needs of the changing rural health care priorities. Having a multi-skilled and competent rural radiographer will, for instance, use part of his/her hospital position to lead in a number of ways both formal and informal such as self-direction which involves applying knowledge that is supported by evidence. Evidence from this study suggest that the current competency provided for in the pre-service training for radiographers place constraints on the capacity of rural radiographers to deliver an all-encompassing diagnostic imaging. It is therefore important for radiography training institutions to understand the competency needs for rural radiographers and the nature of rural practice in order to appreciate the training requirements.

7.2.5 The difference between rural radiography practice and urban practice

Evidence from the study demonstrates that the primary difference between rural radiography and urban practice was the increased responsibilities that demand extra competencies. Rural radiographers still provide traditional diagnostic imaging as they did many years ago but also having increased non radiographic responsibilities. This makes rural radiographers more of a generalist practitioner as compared to their counterparts in urban. One respondent summed up the difference thus:

> *‘‘In rural areas you are everything and everyone from receptionist, PRO, diagnostic radiographer, ultrasonographer, darkroom attendant, filing clerk,*

radiologist, interpreter etc, while in urban radiography you are either a diagnostic radiographer or ultrasonographer.''

To this effect, rural radiographers require, in additional to traditional radiographic competencies, specific competencies unique to rural practice. Moreover, the Alma Ata Declaration more than 30 years ago called for the broadening of healthcare professionals' competencies to allow them respond to the challenges of PHC (Lehmann 2008:164).

7.3 REFLECTION ON THE STUDY

This research has made me, as a researcher, to acknowledge that the current medical system in South Africa and in particular rural areas is medically inclined towards doctors. This status quo favours and supports the powerbase of medical personnel (doctors) and thereby reinforcing their status and prestige (McConnel & Smith 2008:5). This, according to the same authors only devalues a very important role that other health professionals such as radiographers play as part of the healthcare team.

This research has raised a broad range of issues and in some cases questions whose answers are yet to be found. But it has also made me to use, in future, every opportunity to enjoin the broader radiographic fraternity and those in authority who determine the radiographers' activities, to work towards clarifying and understating the changing environment within which rural radiographers operate. What's more, this study strengthens my belief that both extended and expanded competency developments for rural radiographers are 'unstoppable' though they are faced with challenges such as limited resources, outdated policies and reluctance by radiologists to delegate some tasks, limiting scope of practice, lack of clear policy guidelines accreditation and legislation. The results of this study also embodies my view that since rural radiographers are involved in the PHC, they should be at the forefront in reshaping rural radiographic imaging, their role and their destiny. And to do this, it is important that individual rural radiographers become more flexible and sensitive to the paradigm shift taking place in the public healthcare system of South Africa.

The awareness raised, through this research, was that if rural radiographers intended to project a national reputation and thereby be recognised and respected by their

peers in urban hospitals, then they should not be limited by the scope of practice that focuses on the borders of minimal competencies. I will therefore call for radiographers working in rural areas to stand up and together project a loud and clear voice, no longer constrained by current narrow scope of radiography practice but to be aware that modern day South African healthcare system allows them to widen their competencies, hence the scope of practice.

7.4 IMPLICATIONS FOR RURAL RADIOGRAPHY IN SOUTH AFRICA

This research advances the understanding of additional core competencies required to effectively practice rural radiography which may be of importance to both radiography training schools and rural district hospital managers. Therefore, those who are involved in the re-structuring of radiography in South Africa as a profession, namely training institutions, the DoH and the professional board for radiography and clinical technology under HPCSA will have to pay attention to the evidence emanating from this study and other similar studies. These institutions should strive towards empowering individual rural radiographers to fulfill their potential.

7.5 LIMITATION OF THE STUDY

This research provides an overview of the additional core competencies of rural radiographers. Even though this study may have immensely contributed to the broader knowledge of our understanding of the core competencies required by radiographers working in rural areas of South Africa, it is not without limitations. First, the design of this study only allowed for auditing of a single curriculum and the selection of radiographers from only rural hospitals of KZN which in itself is a geographical limitation. Secondly, there was limited literature available for a similar CPD strategy proposal. This shortfall presented a challenge to this study as the researcher did not have a CPD strategy designed specifically for rural radiographers which could have been used to compare with the proposed CPD strategy. Thirdly, since the sample of radiographers was limited to one province it reduces the generalizability of results to the wider population of rural radiographers in South Africa. Fourthly, the competency framework which guided this study was limited in that it only focused on the core competencies of radiographers working in rural areas

only. This means that the framework may not be applicable to radiographers working in regional and tertiary public hospitals and private hospitals. It may require further adjustment and modifications if it is to be applied to other situations.

In view of the above mentioned limitations, it is worthwhile to remind the reader to take into account what the study claims in the text and conclusions made thereof. It must however be stated that despite limitations outlined above, this did not negate the value and contributions that this study has made to the knowledge base of radiography.

7.5.1 Objectivity of this study

The culture of rural radiography has shaped the researchers' views and behaviours over the years of practice just as much as those the researcher sought to study and report on with objectivity. Did the researcher strive to stand outside the culture of rural radiography the very culture that has shaped the researchers' views? As in the words of Pratt (2005:274) *''How far this has been achieved lies very much in the judgment of the reader*.'' However, it can be stated that this researcher is an experienced radiographer rising through the ranks from junior to senior radiographer. Furthermore, this researcher has worked in both urban and rural setting in four different African countries.

7.6 RECOMMENDATIONS

Despite the limitations that have been identified for this study, this research is unique and important in that it may be used as a foundation for other studies. A competency framework and a questionnaire were developed and could be used in other studies after making adaptations if necessary. Below are some of the recommendations based on the study results.

7.6.1. General

The following are general recommendations:

- Skills development programmes should be made accessible to all diagnostic

radiographers working in rural areas. (At the time of completion of this study the KZN department in conjunction with the local university of technology had started training rural diagnostic radiographers in ultrasound).

- Radiography graduates should be guided and be flexible enough to adapt to the ever changing rural health practice and the consequent internal integration. Internal integration will eventually support the successful adoption of external setting.
- A shared responsibility of patients' needs and expectations should be a foundation from where rural radiographers should embark on their tasks.
- Communication and articulation among stakeholders namely radiography training institutions, rural radiographers and employers should be enhanced or be introduced if non-existent.
- Radiographers should work towards having representation at district level and at head office. This will afford the radiographers a platform which can be used to air their work requirements and needs
- Radiography training institutions must acknowledge the difference in rural radiography and understand the nature of rural radiographic practice to be able to appreciate competency needs.
- The results of this study may be used as a point of departure by rural hospital managers and supervisors of radiographers to develop related performance measures.

7.6.2 Radiography curriculum

Evidence from this study shows that radiography training school whose curriculum was audited does do not acknowledge the difference between rural radiography practice and urban practice. The following are therefore recommended:

- Harmonising the curriculum and the scope of radiography to take into account the needs of rural radiographers.
- The curriculum could be revisited and adapted in order to be more closely aligned not only with urban radiographic needs but also rural radiographic needs and also taking patients' needs into account.
- Provision could be made in the curriculum for exposure of students to the

rural setting during pre-service training. Structural partnership between academia and workplace as suggested by Engel-Hills (2005:iv) may be required in this regard.

- Future curriculum review/development must involve stakeholders in order to identify the kind of competencies that need to be included. This is common in other countries such as Australia where health professionals lend immense support to training institutions to develop curriculum that lead to development of student's competencies (Baird 2008:e9).
- If basic ultrasound scanning especially for obstetric cannot be included in the basic training curriculum then an alternative way should be found such as providing an accredited in-service training programme for rural radiographers

7.6.3 The CPD strategy and CPD activities

Having just general radiographic core competencies is not sufficient for the development and sustainability of radiographers in rural areas. According to Carrington *et al* (2010:177) it requires that both the employees (radiographers) and managers accept that competency is the key to provision of quality healthcare. Therefore, radiographers working in rural areas need to be supported by availing to them CPD activities that reflects the needs of rural radiography. This will enable radiographers to develop additional competencies that are more appropriate for rural radiography practice. The CPD strategy, as outlined in Chapter 6, provides a structure to support training and competency development for rural radiographers. The following recommendations are, therefore, proposed:

- The proposed CPD strategy may not be looked at in isolation but rather at wider rural health professional's context. This is because issues of multi-skilling permeate the wider health environment (White 2003:372).
- Rural hospital managers, as representatives of the employer, must strive towards supporting rural radiographers to access CPD activities.
- On-going career development for rural diagnostic radiographers is essential and CPD events can be used to achieve this.
- Some CPD programmes can be structured and delivered online. It should be cautioned from not relying on the on-line delivery alone. This has been

shown to sometimes reduce the quality and contributes to increased feeling of professional isolation. (Remote and Rural Healthcare Education Alliance 2010:8).

7.6.4 Future research

This study could inform future research in this area. It may serve as a pilot study for other studies. To this effect the following recommendations are made:

- It is recommended that future research may consider a countrywide survey of rural radiographers' competencies.
- All curricular of the country's radiography schools could be analysed and compared in order to determine the ability of a radiographer to cope and perform efficiently in rural areas.
- This research may be replicated or used as a departure point for studies focusing on other rural health professionals other than radiographers.
- Replicate study to identify context specific competencies of radiographers working in urban setting.
- Post-doctoral research could be done on the applicability and efficiency of the CPD strategy (refer to CPD strategy in Chapter 6).
- After implementation of the strategy, research could be done to evaluate the whole strategy in order to suggest changes or improvement.

7.7 CONTRIBUTION OF THIS STUDY

The primary contribution of this mixed method study is two-fold, namely the development of a CPD strategy for rural radiographers and identification of some of the additional core competencies required by rural radiographers.

7.7.1 CPD strategy

The first primary contribution of the present study is the development of a CPD strategy proposal for rural radiographers. To the best knowledge of the researcher, this is the first strategy developed for the rural context. One notable advantage of

this strategy is that it could be adapted or adopted and be used by other rural healthcare professionals.

7.7.2 The outline of competencies as spin-off

Another important contribution of this study has been the development of a competency framework (Figure 1.1) for rural radiographers. The framework is the first in the context of radiographers working in rural areas of South Africa. The RRCF is an intergraded tool highlighting not only competencies related to imaging but also to a range of interdisciplinary and interpersonal competencies. Furthermore, this study is the first to attempt to identify and document some of the additional core competencies deemed essential for radiographers in rural hospitals.

7.8 CONCLUSION

This study offers substantial evidence to support the suggestion that the expanded competencies needed by rural radiographers are not just focused on radiologist-led domains but also on areas that are traditionally the domain of other professionals outside the diagnostic imaging terrain. The findings of the study further show that rural radiographers can no longer continue practicing radiography based solely on the competencies they obtained at the point of graduation and neither can they rely on the current audited curriculum and the scope of radiography practice which by its nature appear to focus on minimum competencies that hinders the extension and expansion of radiography practice in rural areas. A commitment is required by all radiography training institutions to recognise the unique nature and inherent importance of competency in the practice of rural radiography. Equipping radiographers with such additional competencies will make rural radiographers within the multidisciplinary team not to be defined by the radiography profession but by the competencies that make them deliver rural radiography services according to the needs of patients (James, *et al* 2012:153). From the above one is to conclude that high quality diagnostic imaging in rural areas requires radiographers who are well trained and have up-to-date context specific core competencies that are supported by relevant CPD activities.

Collectively, the findings of this mixed method research not only bring to the fore the complex nature of additional core competencies required by rural radiographers but it also highlights the complex nature of rural radiography practice. Nevertheless, it is hoped that this study provides substantial proof of evidence of additional competencies and, therefore will act as a catalyst to influence the future of radiographers working in rural areas of South Africa, and possibly in comparable environments in the countries of the sub region.

It may not be enough just to have knowledge without action. The German scientist who discovered X-rays once said:

> *''It is very agreeable to have broad knowledge, and it is sometimes useful, but after all it is only the activity that brings real satisfaction.''*
>
> Wilhelm Conrad Röntgen 1845 – 1923

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ANNEXURE V

Phase I: Invitation letter

Mosvold Hospital
Diagnostic Imaging Services
P/B X 2211
Ingwavuma 3968

22.07.2014

Dear Respondent

INVITATION TO PARTICIPATE IN THE FOCUS GROUP INTERVIEW

You are invited together with one of your senior radiographers to participate in a research study that forms part of a degree of Doctor of Literature and Philosophy in Health studies at the University of South Africa. The research topic is entitled: Core Competencies of radiographers working in rural areas of South Africa.

The aim of this study is to investigate the core competencies required by radiographers working in rural district hospitals of KZN in order to propose a CPD strategy which takes into consideration the specific needs of their working environment..

You are going to be part of the focus group discussion because of your valuable insight and unique experience in rural radiography. The discussion will start at 11:00hrs on the 1st August 2014 at Ghost mountain hotel in Mkuze. The total time scheduled will not be more than 3 hours. Refreshments/lunch will be provided. Ethical clearance for the study has been obtained from both the UNISA and KZN department of health. The promoter for this study is Prof. Annali Botha from UNISA (012 429 8814).

The researcher intends, with your input, to develop a questionnaire which will then be distributed to all radiographers working in Level 1 rural district hospitals of KZN. Your insight and expertise about the topic is valued. Your participation and consequently your input may help to ensure that rural radiographers are recognised as esteemed professionals and important role players in the delivery of rural health care. Furthermore, your contribution may also help the researcher to propose a CPD strategy that is tailored towards the rural radiographers' unmet needs.

Participation in this study is voluntary. You are under no obligation to take part if you don't want to. Please be assured that all the information you provide will be kept confidential and anonymous. In this regard, you do not need to sign anything. However, your participation will be deemed as consent.

Your participation and support for this study will be highly appreciated.

...……

MR. B. MUNG'OMBA (Researcher)

ANNEXURE IV

Phase I: Questionnaire

QUESTIONS FOR FOCUS GROUP INTERVIEW PHASE 1 (QUALITATITVE)

1. What, in your own opinion is the context in which radiographers in rural area practice?
2. What in your own opinion are specific competencies (Knowledge, Skills, attitudes and behaviours) does a rural radiographer require to practice?
3. Are you happy with your own competency? Explain your answer
4. Are you satisfied with the extra responsibilities that you are given other than Radiography and were those responsibilities included in your training prepare? (explore reasons)
5. What are the things that are needed to make rural radiographers more effective?
6. Do you think your training prepared you fully to work in rural hospitals? Explain your answer.
7. What is it that you think should have been included in your training to properly prepare you for rural practice?
8. Do you think the CPD activities on offer take into account the needs of rural radiographic practice? Explain your answer and if possible make suggestions of things that may be included in these CPD seminars.

ANNEXURE VI

Phase II: Questionnaire

QUESTIONNARE FOR PHASE 2: SURVEY

SECTION 1: RESPONDENTS' DEMOGRAPHICS

This section requires your general demographic information.

1. Please indicate your gender by ticking in the appropriate box

Male	**1**	
Female	**2**	

2. Indicate your present post by ticking in the appropriate box.

Post	**Com.serv**	**Grade 1**	**Grade 2**	**Grade 3**
	1	**2**	**3**	**4**
Radiographer/				
Chief Radiographer				
Assistant Director: Radiographer				

3. Please indicate your highest qualification in radiography by ticking in the appropriate box.

Qualification		
Certificate	**1**	
National Diploma	**2**	
Bachelors. degree	**3**	
Masters degree	**4**	
Doctoral degree	**5**	

4. Please indicate how many years of work experience do you have by ticking in the appropriate box.

Experience in years		
2 years and less	**1**	
3 – 5 years	**2**	
6 – 8 years	**3**	
9 -11 years	**4**	
12 years and above	**5**	

SECTION 2: THE ENVIROMENT IN WHICH RURAL RADIOGRAPHERS PRACTICE RADIOGRAPHY

This section deals with the issues that may relate to the environment in which you practice radiography. Please tick **'Yes'** if you agree and **'No'** if you disagree.

Questions	Yes	No
5. Are the health services especially x-ray in rural areas well-organised to your satisfaction?		
6. Do doctors in rural areas request many x-ray examinations which are unnecessary?		
7. Do the doctors in rural areas ask the opinion of radiographers on x-rays?		
8. Do patients in rural areas demand to be x-rayed even if the x-ray examination is not indicated?		
9. Are the rural hospitals equipped with modern equipment?		
10. Does the absence of specialists such as radiologists in rural hospitals affect the work of radiographers?		
11. Do you think rural radiography practice is more boring than urban radiography practice?		
12. Do rural radiographers have appropriate competencies to provide radiographic services that is designed to support PHC?		
13. Does rural health professionals especially doctors appreciate the role of radiographers in the management of patients?		
14. Do you think that lack of representation of radiographers in broader management (at district and head office) affect the overall work of radiographers?		

15. (a) Please mention other issues or challenges that you face as you practice radiography in your rural hospital (please use attached **extra page 10** if space provided is small).

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    (b) Feel free to comment on the questions above or give reasons on those questions which you answered no to (please use attached **extra page 10** if more space is needed

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SUBSECTION 2.1 COMPETENCIES FOR RURAL RADIOGRAPHERS

The following section includes statements about the competencies that may be required for radiographers working in rural areas. Please indicate to what extent you personally agree or disagree with the following statements using the key below.

KEY: Strongly Agree = 4
Agree = 3
Disagree = 2
Strongly Disagree = 1

A. Teamwork in rural healthcare

Statement	1	2	3	4
1. There is cooperation between your x-ray department and the other team members e.g. doctors and nurses.				
2. A radiographer accepts shared responsibility for patient management				
3. A radiographer should respect the professions of other healthcare team members.				
4. A radiographer should negotiate with other team members such as doctors for the good of the patients.				
5. Doctors as members of the rural health team respect the radiography policies and guidelines.				

B. Attitude and behaviours required by rural radiographers

Statement	1	2	3	4
6. Radiographers in rural hospitals respect each patients' cultural beliefs while in their care				
7. Radiographers are aware that behaviours can influence their radiographic performance				
8. Radiographers always project a positive attitude at all times				
9. Radiographers are able to acknowledge the limitation of their knowledge and skills				
10. Radiographers always respect the views of other healthcare professionals				
11. A radiographer acknowledges each patients' religious beliefs while in her/his care				

C. Communication in rural radiographic practice

Statement	1	2	3	4
12. Rural radiographers are able to communicate effectively with patients from all walks of life.				
13. A radiographer should be able to communicate effectively with other members of the rural healthcare team				
14. A rural radiographer possess culturally appropriate communication skills necessary for the rural working environment				
15. A rural radiographer is able to identify communication that is appropriate to the client's cultural needs.				

D. Rural radiography and leadership

statement	1	2	3	4
16. Rural radiographer leaders are accountable for the professional leadership of a radiographic team				
17. Rural radiographer leaders foster the skills development of other radiographers				
18. Rural radiographer leaders are able to suggest applicable solutions to departmental problems				
19. Rural radiographer leaders use critical thinking skills to support clinical decision-making				

20. What do you think are some of the barriers to one being a good radiography leader in rural areas? (please use attached **extra page 10** if space is small)

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E. Rural radiography and management

Statement	1	2	3	4
21. I am able to organise workload and patient flow even when there are few radiographers				
22. I am able to participate fully in hospital committees where the interest of radiography is discussed				
23. I am aware of budgetary control as related to the required resources for the x-ray unit				
24. I am aware of the hospital structure and policies including procedures				
25. I am able to manage human resources in the x-ray department effectively				

F. Ethical practice in rural radiography

Statement	1	2	3	4
26. A radiographer is required to apply the principle of informed consent in radiographic practice.				
27. It is the responsibility of a radiographer to adhere to the principles of confidentiality.				
28. Ethical principles require the radiographer to be sensitive to cultural beliefs of the patients				

SECTION 3: RADIOGRAPHY TRAINING AND RURAL RADIOGRAPHY

This section is about your training, career support and development. Please indicate to what extent you personally agree or disagree with the following statements.

A. Radiography training

Statement	1	2	3	4
29. The radiography curriculum provides for exposure of radiography students to rural set up during training				
30. The training equipped me to be able to adapt to the demands of rural radiography practice.				
31. A radiographer is able to maintain a film processor including cleaning and changing chemicals				
32. My training enables me to formulate innovative solutions to rural radiographic challenges				
33. Rural radiographers need short courses to supplement their current skills				

34. What are some of the values and skills that you think should have been included in the curriculum to enable graduate radiographers succeed in rural areas? (please use attached **extra page 10** if space provided is small)

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B. Rural radiographic practice

Please read the following statements and indicate your answer by ticking either **'Yes'** if you agree or **'No'** if you disagree

Statement	Yes	No
35. Rural diagnostic radiographers must have the ability to do basic clinical assessment of the affected area		
36. Rural diagnostic radiographers must have the ability to perform basic obstetrics and gynaecology ultrasound scans.		
37. Rural radiographers perform basic abdominal ultrasound		
38. In some rural hospitals diagnostic radiographers are asked to do ECG.		
39. Rural radiographers like other allied professionals may also introduce outreach services (obstetric ultrasound) to the clinics		
40. Rural diagnostic radiographers may use this outreach services to give information to the communities about x-rays once it is introduced.		
41. The existing scope of practice for radiographers limits the role of rural radiographers when caring for the patients.		

42. Please mention any other task that you are required to do but you have problems to do them because they are not part of the scope of radiography (please use attached **extra page 10** if provided space becomes small)

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SECTION 4: CPD ACTIVITIES AND RURAL RADIOGRAPHY PRACTICE

This section deals with CPD activities in relation to rural radiography practice. Please indicate to what extent you personally agree or disagree with the following statements by ticking in the appropriate box

A. Role and meaning of CPD in rural radiography practice

Statement	1	2	3	4
43. The CPD seminars include topics that are essentially relevant to rural radiographic practice				
44. The teaching of CPD activities that I have attended so far have been evidence-based				
45. I attend CPD activities to increase my professional competency				
46. I attend CPD activities only to accumulate points required for me to maintain my HPCSA registration				
47. It is the responsibility of the hospital to foster competency of radiographers through CPD support				

B. Barriers to CPD:

This subsection is related to barriers that you may encounter in accessing CPD workshop/seminars. Please indicate your answer by ticking either **'Yes'** or **'No'**

Question	Yes	No
48. Does your hospital provide you with necessary support such as transport to attend CPD seminars?		
49. Are you discouraged to attend CPD seminars/workshops because of the distance to where they are held?		
50. Are you unable to attend CPD seminars because of the shortage of staff in your x-ray department?		
51. Are you discouraged from attending CPD seminars because the topics covered are irrelevant to your rural practice?		
52. Do you think there is lack of support by rural hospitals for radiographers to attend CPD activities?		

C. Suggestions that may be added to a CPD strategy proposal

The following suggestions may be included in the CPD strategy proposal. Please answer by ticking **'Yes'** if you agree or **'No'** if you disagree.

Statement	Yes	No
53. CPD activities must take into account the needs of rural radiography practice		
54. CPD activities must take into account the potential gap between theory and the actual rural practice.		
55. CPD seminars must be rotated so as to include rural areas		
56. Each health district health must be responsible for their own CPD activities.		

Please proceed to the last question 57 on the next page.

57. Please tick from a list of topics or interest areas those that you would like to be included in the future CPD seminars/workshop. You can tick as many as you like.

Topics that may be included in future CPD activities	
Digital Imaging	
Ultrasound scanning in rural areas	
Image interpretation (Chest and Skeletal)	
Communication skills in the context of rural areas	
Leadership in rural radiography	
Management in rural radiography	
Ethical aspects of rural radiography	
The role of radiography in PHC	
Supervisory skills	
Team work skills	
Problem solving	
Darkroom techniques	
Reflective thinking	
Critical thinking	
National Core Standards and rural radiography	
Drawing of operational plan, procurement plan, skills development plan (HRD)	
MRI, CT	
Basic principles of Supply Chain Management	
Customer services skills	
Attributes and behaviours required in rural radiographic practice	
Interpersonal relations	
Others-Suggest	

58. Please give reasons why you think that rural radiography practice differ from urban practice (please use attached **extra page 10** if more space is needed)

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59. In your opinion what do think are the three most important tasks that you perform
on a regular basis that are not performed in urban hospitals? (please use attached **extra page 10** if more space is needed).

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ANNEXURE VII

Letter of consent: Phase II study

Mosvold Hospital
X-Ray Department
P/B X2211
Ingwavuma 3968

15-01-2015

Dear Respondent

INVITATION TO TAKE PART IN THE RESEARCH STUDY

You are invited to take part in a research study that forms part of the degree of Doctor of Literature and Philosophy in Health studies (D Litt et Phil) at the University of South Africa. The research topic is entitled: ***Core Competencies of radiographers working in rural areas of South Africa.*** The promoter for this study is Prof. Annali DH Botha from UNISA ([redacted]). Ethical clearance for the study has been obtained from both the UNISA and KZN department of health

The aim of this study is to investigate the additional core competencies required by radiographers working in rural district hospitals of KZN in order to propose a CPD strategy which takes into consideration the specific needs of their working environment.

Along with this letter is a questionnaire which is divided in four major sections. Section 1 is about your demographic information. Section 2 – 4 contains questions where you will be required to give 'Yes' or 'No' as your answer and questions where you will be required to give your answers on a rating scale; strongly agree to strongly disagree. The questionnaire will take you less than ***30 minutes*** to complete. Once completed you can scan and email it back to the address give below or return it to the person who issued it to you who then will email, fax or post it back to the researcher.

Your participation and consequently your input may help to ensure that rural radiographers are recognised as esteemed professionals and important role players in the delivery of rural health care. Furthermore, your contribution may also help the researcher to propose a CPD strategy that is tailored towards the rural radiographers' unmet needs.

Participation in this study is voluntary. You are under no obligation to take part if you don't want to. Please be assured that all the information you provide will be kept confidential and anonymous. In this regard, you do not need to sign anything. However, your completion and return of the questionnaire, thereof, will be deemed as consent.

If you have any questions, concerns or if you need clarification on how to go about answering the questionnaire, please do not hesitate to contact Mr Bernard Mung'omba (principal researcher) on [redacted] during office hours or on Cellular no[redacted]. Alternatively you can contact the study promoter Prof. ADH Botha on Tel: [redacted] during office hours

Your participation and support for this study will be highly appreciated.

...……

MR. B. MUNG'OMBA (Researcher)
ASSISTANT DIRECTOR: RADIOGRAPHER