



ROLE EXTENSION OPPORTUNITIES IN DIAGNOSTIC  
RADIOGRAPHY IN GHANA AND ITS POTENTIAL TO  
IMPACT ON PATIENT CARE

Thesis submitted for the degree of

Doctor of Philosophy

By Abdul-Razak Wuni

Cardiff University

School of Healthcare Sciences

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## Declaration

This work has not been submitted in substance for any other degree or award at this or any other university or place of learning, nor is being submitted concurrently in candidature for any degree or other award. Signed ~~Abdul Razak Wuni~~ (candidate) Date

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## Dedication.

I dedicate this thesis to my late father C.S Wuni who has been my inspiration through it all.

You gave me the best gift anyone could ever ask for and I continue to be grateful for it.

Continue to rest in peace till we meet again.

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And finally, last but by no means the least, I am thankful to God for seeing me through this. Only you are worthy of worship.

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## Abstract

### **Background**

The thesis is the result of an in-depth study which explored opportunities for role extension in diagnostic radiography in Ghana and its potential to impact on patient care. Ghana is faced with a shortage of radiologists, further compounded by a skewed distribution, increasing workload and a government that is committed to improving the healthcare of patients. The shortage of radiologists and uneven distribution therefore results in most radiographs produced being unreported. This results in patients being managed without the full diagnostic information, affecting the quality of healthcare.

### **Study design**

A qualitative single case study with multiple (three) sites design was used to explore role extension opportunities in diagnostic radiography in Ghana and its possible impact on patient care. The sites and participants were selected purposefully to ensure maximum variation and to cover the country. Data were collected through semi-structured interviews, observations of the participants' working day and analysis of relevant and available official documents.

### **Findings**

Thematic analysis of the data produced three overarching themes: challenges to professional practice, education and training and policy planning and implementation for role extension. The first theme exposed the numerous challenges to practice, faced by radiographers across the sites, which affect the flow and quality of healthcare.

The critical role that education and training will play in the introduction and sustenance of role extension roles has been established.

The important role that policy will play in the implementation of role extension in diagnostic radiography is emphasised.

### **Conclusion**

There is evidence of role extension amongst radiographers in Ghana. It is dependent on the local situation and arrangements made within the facility. There is clearly an urgent need for the introduction of role extension in order to reduce the radiologists' workload and improve healthcare. The main area of need in role extension is interpretation of plain radiographs in deprived areas.

## Abbreviations

GoG	Government of Ghana
LMIC	Lower Middle Income country
GDP	Gross Domestic Product
MoH	Ministry of Health
GHS	Ghana Health Service
AHPC	Allied Health Professions Council
NHA	National Health Insurance Authority
NHIS	National Health Insurance Scheme
NHIL	National Health Insurance Levy
NHIF	National Health Insurance Fund
VAT	Value Added Tax
SSNIT	Social Security and National Insurance Trust
GHS	Ghana Health Service
THOSP	Teaching Hospitals
QGIH	Quasi Government Institution Hospitals
PHMHB	Private Hospitals and Maternity Homes Board
DTAM	Department of Traditional and alternative medicine
GHSP	Government Hospitals



PC	Poly Clinics
HC	Health Centres
MBP	Mission Based Providers
PMDP	Private Medical and Dental Practitioners
TMP	Traditional Medicine Providers
AM	Alternative Medicine
FH	Faith Healers
GSR	Ghana Society of Radiographers
CPD	Continuous Professional Development
CoR	College of Radiographers
SCoR	Society and College of Radiographers
RCR	Royal College of Radiologists
BARP	British Association of Radiology and Physiotherapy
DoH	Department of Health
CT	Computed Tomography
MRI	Magnetic Resonance Imaging
PET	Positron Emission Tomography
WHO	World Health Organisation
ED	Emergency Department

OSE	Objective Structured Examination
MRMC	Multiple reader multiple case
AFROC	Alternative free response operating characteristic
CTC	Computed tomography Colonography
IVU	Intravenous Urograms
A&E	Accident and emergency
JAFROC	Jack-knife alternative free-response receiver operating characteristics
NDPC	National Development Planning Commission
RDHS	Regional Director of Health Service
GMA	Ghana Medical Association
PACS	Picture archiving and communication system
GAEC	Ghana Atomic Energy Commission
RPI	Radiation Protection Institute
TLD	Thermo luminescent dosimeters
NRA	Nuclear Regulatory Authority
HeFRA	Health Facilities Regulatory Authority
NCTE	National Council for Tertiary Education
MDC	Medical and Dental Council

## Chapter One

### Setting the scene

#### 1.1 Brief history of Ghana

Ghana, previously known as the Gold Coast, is located on the West Coast of Africa along the Gulf of Guinea. Ghana became independent in 1957 becoming the first sub Saharan country to gain independence from British colonial rule (Presidency Ghana, 2017). Ghana, although a small country by landmass and population, is regarded as a leading light in Africa, mainly because it was the first black African country to achieve independence. Ghana shares borders with Ivory Coast to the west, Burkina Faso to the north, Togo to the east and the Gulf of Guinea to the south (CIA, 2017).

Ghana is known for its long stretches of beautiful sandy beaches along the coast. The name of the country is derived from the ancient empire that was located northwest of the present location of Ghana. Ghana has a rich cultural heritage which varies across the country (CIA, 2017).

Ghana, when known as the Gold Coast, had direct trade relations with Europe. The inhabitants, based mostly along the coast, traded with the Dutch, British, and Portuguese amongst other Europeans. These Europeans built forts and castles along the coast for their inhabitation and to protect their interests. Some of the forts and castles are now being used as tourist sites. Initially, the trade between the indigenes and the Europeans was mainly in gold, which was readily available, and **was** the reason the British named the area the Gold Coast. However, the interest in gold waned in favour of the more profitable slave trade in the 17<sup>th</sup> century (Britannica, 2017).

English is the official language of Ghana and life expectancy is 64.9 for males and 70.0 for females. Cedi is the national currency with Christianity, Islam and indigenous worship being the major forms of religion. The capital city of Ghana is Accra and the other major city is Kumasi (CIA, 2017).

Ghana operates the presidential system of governance with an Executive President. There are three arms of the government. The Executive headed by the President, the Judiciary headed by the Chief Justice and the Legislature headed by the Speaker of Parliament (CIA, 2017). The executive authority of Ghana, per the 1992 Constitution, is vested in the President who exercises that authority in accordance with the Constitution (CIA, 2017).

The President is responsible for the implementation and enforcement of the laws passed by Parliament and appoints a cabinet to assist him in the determination of general policy of the Government. The Cabinet is made up of the President, the Vice President and not less than ten and not more than nineteen Ministers of State.

Ghana had a population of 24,658,823 at the last population and housing census in 2010 (Ghana statistical service, 2013). Administratively the country was divided into ten regions at the time of the study: Greater Accra, Eastern, Western, Ashanti, Brong Ahafo, Central, Volta, Upper West, Upper East and Northern regions. Northern regions account for 29.5% of the landmass of Ghana and is the largest region (Government of Ghana. Northern, 2017). Six additional new regions have been created after a referendum was held in December 2018. Northern region comprises three regions; Northern, Savanna and North East regions, Western region has been divided into Western, and Western North, Brong Ahafo has been divided into, Bono, Bono East and Ahafo regions whilst Volta has been divided into Volta and Oti regions (graphic.com.gh). A map of the new

regions is attached as Appendix J. The regions are further divided into districts. There are political heads known as the Regional Ministers and the District Chief Executives who head the regions and districts respectively. Both are appointed by the President and serve at his pleasure (Presidency republic of Ghana, 2016).

## 1.2 Economy of Ghana

Agriculture employs the largest part of the workforce and contributes about 20% of the Gross Domestic Product (GDP) of the country. The workforce is largely made up of small-scale landholder farmers. Major sources of foreign exchange in Ghana include, gold, cocoa, oil and remittances from Ghanaians abroad. The discovery of oil and its expansion has led to economic growth. First production of oil started in 2010 and since then more fields have been discovered and production has started. The first gas processing plant for the country was established and is producing gas for power production in the country (CIA, 2017).

The economy of Ghana experienced a steady growth averaging 7% per year from 2005 to 2010 and thus attained a lower middle income (LMIC) status as a country with a per capita income of about \$ 1,820. However, it has been argued that using the per capita income as an indicator of the performance of the economy is problematic as it is narrow (Ghana poverty and inequality, 2016, Nketiah-Amponsah, 2015)

Estimates show that about 8.4% of Ghana's population (comprising 2.2 million people) live in extreme poverty and 70% of this population of people with income below the poverty line (GH¢ 1314) live in the northern part (Upper West, Upper East and Northern regions) of Ghana (Ghana statistical service, 2013). Most people living in the northern part

of the country survive on farming (Ghana statistical service, 2013) and even though poverty rates have largely reduced elsewhere in the country due to rapid urbanisation, this does not appear to be the case in this part of the country (Ghana statistical service, 2013).

On average the annual household expenditure is estimated at GH¢ 9317 whilst the mean annual per capita expenditure is GH¢ 6337 and the estimated annual household income for the country is GH¢ 61,507 million (Ghana statistical service, 2014).

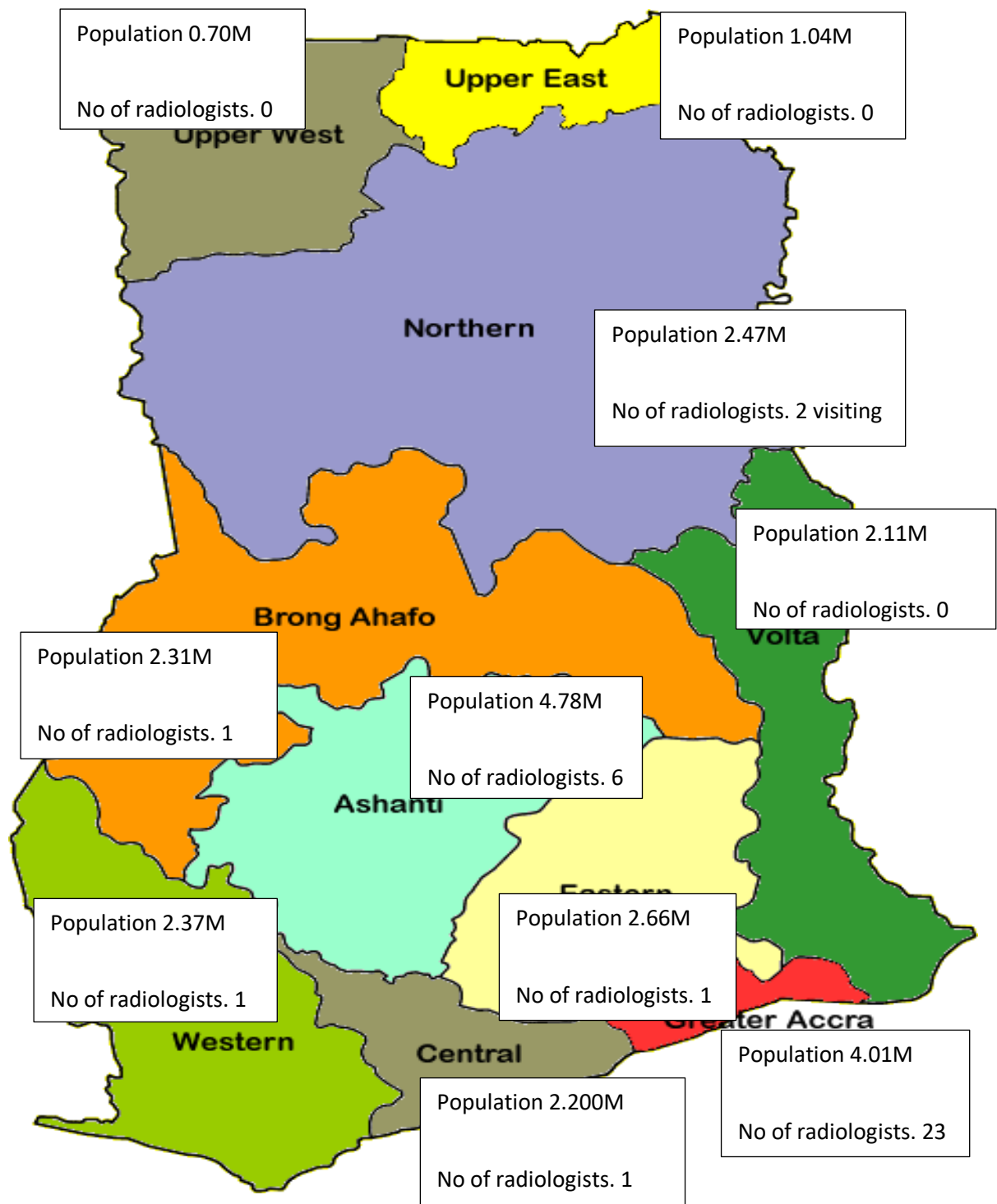


Figure 1. 1 Map of Ghana with regions with their population and number of radiologists

(RCR, 2014)

### 1.3 Healthcare services.

The healthcare sector plays a central role in the socioeconomic development of any nation. Ghana has a national policy that seeks to guide and provide a holistic framework to consolidate the progress made in the sector (Ministry of Health, 2007). Health expenditure in terms of GDP increased slightly from 3.1% to 3.6% in 2014 and health expenditure per capita increased from \$19 to \$58 (World Bank, 2017a, World Bank, 2017b). These figures show a commitment by Government towards improved quality of care within the sector by increasing investments. The private sector has also made significant contributions towards improving the quality of care to patients who can afford it.

All these investments notwithstanding, there are still large sections of the population that do not have access to basic healthcare services, mostly in rural and deprived communities. Factors contributing to poor geographic access in Ghana include insufficient investments in health facilities, poor roads making it difficult to access communities and sparse distribution of health facilities (Ministry of Health, 2007).

Health services in Ghana are under the jurisdiction of the Ministry of Health (MoH) which formulates policies, the Ghana Health Service (GHS) and teaching hospitals implement them. The GHS and teaching hospitals are agencies under the MoH. Apart from policy formulation the MoH also has oversight responsibility of the teaching, private and mission hospitals which fall outside the control of the GHS. Some of the departments and agencies under the MoH are the regulatory bodies such as the Allied Health Professions Council (AHPC) (Ministry of Health Ghana, 2017). Figure 1.2 on page 9 shows the structure of healthcare services in Ghana.



### 1.3.1 Organisational structure of Ghana Health Service

Administratively, GHS has three levels: the national, regional and district levels. Functionally however, the GHS has 5 levels: the national, regional, district, sub-district and community levels. It also has a 12-member council that is required to ensure the GHS performs its functions effectively (Ghana Health Service, 2017).

Administratively, the national level is made up of the National Council, Office of the Director General and the Deputy Director General and eight National Divisional Directors. The regional level is headed by Regional Directors and the Regional Health Management Team, whilst the district level is headed by the District Directors and supported by the District Health Management Team (Ghana Health Service 2017).

The District Directors of health services have oversight responsibilities for the hospitals and clinics in the district and all the District Directors report to the Regional Director under whose region their district falls. The Regional Directors in turn report to the national level. The Regional Directors have oversight responsibility of the regional hospitals (Ghana Health Service 2017).

### 1.3.2 Health insurance in Ghana.

Prior to the year 2003, Ghanaians had to pay directly for healthcare services, this system was popularly referred to as 'cash and carry'. This system was a barrier to access to healthcare services by the poor and vulnerable in society as they could not pay for the service (Ministry of Health, 2007). The government of Ghana in an attempt to address the challenges of the 'cash and carry' system, introduced the National Health Insurance Scheme (NHIS) by passing a law in parliament (National Health Insurance Act 2003, Act

650). This was introduced to allow Ghanaians access to affordable quality healthcare services whether rich or poor (Ministry of Health, 2007, Ministry of Health, 2004). The scheme is a social protection scheme and as such the government had to find a sustainable funding source as the premiums were set too low to sustain the scheme so that most citizens could afford to register (Ministry of Health, 2007). A National Health Insurance Levy (NHIL) of 2.5% was placed on goods and services and collected under Value Added Tax (VAT), a 2.5% of social security contributions to the Social Security and National Insurance Trust (SSNIT), returns from investments of the National Health Insurance Fund (NHIF) and premiums (National Health Insurance Scheme, 2017) served as the sources of funding for the scheme. People who are enrolled on to the NHIS will be able to access healthcare services, both private and public, that have been accredited by the National Health Insurance Authority (NHIA) to provide the given service (National Health Insurance Scheme, 2017). There are also some private health insurance companies that have various specific packages for their clients.

However, the NHIS is faced with some challenges. There have been reports in the media of delays in payments of claims submitted by various services providers leading sometimes to temporary suspension of the service to NHIS client. These delays have often hampered the delivery of healthcare services across the country (Myjoyonline, 2019).

THE STRUCTURE OF GHANA HEALTHCARE SYSTEM

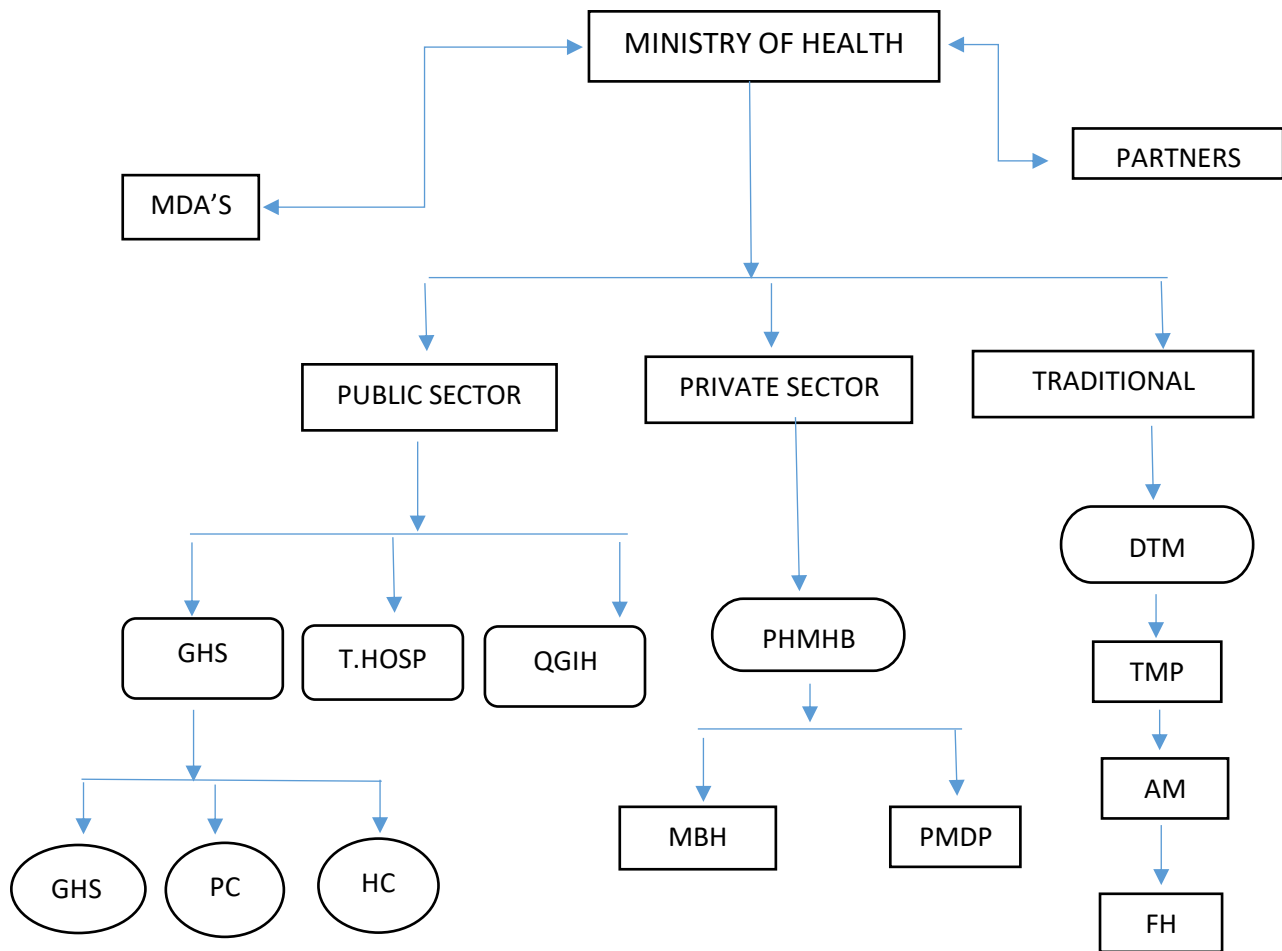


Figure 1. 2 Structure of healthcare in Ghana

**Key**

MDA's - Ministries Departments and Agencies

GHS – Ghana Health Service

THOSP – Teaching Hospitals

QGIH – Quasi Government Institution Hospitals

PHMHB-Private Hospitals and Maternity Homes Board

DTAM – Department of Traditional and alternative medicine

GHSP – Government Hospitals

PC – Poly Clinics

HC – Health Centres

MBP – Mission Based Providers

PMDP – Private Medical and Dental Practitioners

TMP – Traditional Medicine Providers

AM – Alternative Medicine

#### 1.4 Development of radiography and radiological services in Ghana

Radiography in Ghana is over nine decades old. The journey has been a very difficult and challenging one, right from when nurses were given a few weeks training to operate radiographic equipment to a point where radiography now has a degree programme and a regulatory body for radiography like all other Allied Health Professions (Ghana Society of Radiographers, 2016).

The first radiology unit was established in the Korle Bu teaching hospital in 1929 by the colonial Governor responsible for the Gold Coast, Sir Gordon Guggisberg. This was mainly because there was a nationwide outbreak of tuberculosis, especially amongst miners and in mining communities. The unit was used mainly for screening of citizens for early detection and treatment (Ghana Society of Radiographers, 2016).

A radiography training school was established by the British before independence which was located within the Korle Bu teaching hospital. There is uncertainty about its exact date of establishment, however the first Ghanaian to head the school was appointed in 1951 after being educated as a radiographer in the UK. There was a practice of sending students to the UK to be educated as radiographers but this was stopped and a school was established locally to take up the task. Upon successful completion of the programme

the graduates were initially designated as X-ray operators, this was changed decades later to radiologic technicians or X-ray technicians. After successful completion of the training, graduates were awarded a certificate of proficiency by the MoH (Ghana Society of Radiographers, 2016).

In 1981 there was a revolution in radiography training in Ghana and a new principal was appointed. At the time of this appointment the school had only one classroom, no curriculum and no books. Even though the school was under the MoH and enrolment figures were jointly determined by the school and the MoH, the school had no budgetary support from the MoH. Korle Bu teaching hospital that housed the school also did not have any budgetary allocation for the running of the school. The job of the new principal was therefore clear.

The decision was made to use the UK Society of Radiographer's syllabus (at the time the Society of Radiographers in the United Kingdom wrote syllabus for radiography training and modified it to meet local needs). So, for the first time in the history of the school it now had a syllabus (Ghana Society of Radiographers, 2016).

The Ghana Society of Radiographers (2016) argues that radiological services were very poor in the country in the early 1980s, compounded with the very few qualified tutors; enrolment into the school was only once every three years. This continued until 2000 when this was changed and a yearly intake was introduced. This change became necessary after the Government of Ghana contracted a manufacturer to supply all government hospitals with new general purpose X-ray machines and to maintain them for an initial period of 10 years. The contract was signed in 1995 but the installation of this equipment

did not start immediately. The first set of machines were installed towards the end of 1996 and, from then on, many more of the hospitals had new machines installed. By 1999 equipment was installed all over the country but without the qualified personnel to operate them.

With new equipment installed all over the country came the problem of staffing because there were not enough radiographers in the country to operate the equipment that was being installed. The MoH, therefore, resorted to giving two weeks training to nurses and other allied health professionals to enable them to operate the machines. To end this unhealthy and dangerous practice the MoH decided that the school would now introduce yearly intakes to cater for the manpower needed to operate the new machines. To ensure the smooth and effective implementation of the new policy of a yearly intake, additional radiographers were to be trained outside of Ghana to augment the teaching staff. This continued until the University of Ghana started a Bachelor's programme in 2002/2003 academic year (Ghana Society of Radiographers, 2016).

Moreover, whilst all this was taking place, a curriculum that was developed for the diploma and the degree programmes was being reviewed. The MoH decided to go ahead and start a 3-year diploma training course whilst they waited for approval of the curriculum for the bachelor's programme. The diploma was started in the 2001/2002 academic year by the school of radiography under the MoH (Ghana Society of Radiographers, 2016).

The Ghana Society of Radiographers (2016) argues that the introduction of a degree in radiography in Ghana did not meet the kind of challenges that were being met in the UK

at the time of introduction. Price et al (2009) argued that, in the UK experience, the Department of Health did not see the need for a degree programme in radiography. However, in Ghana it was the MoH that actually pushed for it. This could be because by the time the decision had to be made many other countries, including the UK, had sufficient justification for it. The start therefore took place without any hitches and the first batch of BSc Radiography students started in the 2002/2003 academic year on a 4-year programme.

Owing to the introduction of the degree programme, which came not only with a yearly intake but also an increased number, a lot more radiographers qualified within a short time. This number was much more than the MoH and GHS could absorb at the time. Luckily however, there was an increase in the number of new private diagnostic centres being set up. These centres employed some of the graduates and reduced the numbers without jobs after graduation (Ghana Society of Radiographers, 2016).

Having developed a well-structured educational programme, there was a need to get an effective regulatory framework in place. At the time this was absent for all the allied health professions. The nurses and midwives were regulated by the Nurses and Midwives' Council and Pharmacists by the Pharmacy Council. After a lot of lobbying and justification an Act of Parliament (Act 857, 2013) was passed in 2013 establishing the Allied Health Professions Council (AHPC). The Council's aim was to regulate the education and practice of allied health professionals in Ghana (Allied Health Professions Council, 2016).

The Ghana Society of Radiographers (GSR) although formed some 30 years ago, has not been very vibrant in terms of policy advocacy, training or welfare of its members until very recently. It therefore has not achieved much as a society but thankfully the last couple of

years have seen tremendous progress being made. For instance the society, in association with other societies of allied health professionals, is advocating for the establishment of the Ghana College of Allied Health Professions. This college, once established, will become responsible for postgraduate education and specialization within the various allied health professions. The MoH has so far been very supportive and it is hoped this will see the light of day in the next few years (Ghana Society of Radiographers, 2016).

The designation and placement of newly qualified radiographers on the salary scale by the MoH and GHS has been a major source of concern over the years as they have moved from being designated as X-ray operators to X-ray technicians, technical officers and now radiographers. The wrong designation could result in the wrong placement on the salary structure which would mean that radiographers would be underpaid compared to other allied health professionals (Ghana Society of Radiographers, 2016). The GSR does not have the power to bargain for placement of its members on the salary structure because it does not have a bargaining certificate as a trade union. Therefore, in any labour related disputes radiographers must depend on the Health Services Workers' Union which is made up of a conglomerate of non-healthcare professional personnel working in hospitals. GSR is hugely challenged and as such has not been able to get professional indemnity for its members whilst practising, and it does not have endowments or educational funds nor any retirement funds.

Tremendous strides have been made in the practice of radiography in Ghana, however there is much that still needs to be done to further enhance radiographic practice.



## 1.5 Contextual background of study

A radiologist is a medical officer who has specialised in radiology to interpret radiographs and carry out other complex radiographic examinations, such as interventional procedures. A radiographer on the other hand is a professional educated to obtain radiographic images or administer radiation for therapeutic purposes. A radiographer can be either a diagnostic or therapeutic radiographer in terms of their practice focus ([Radiographycareers, 2017](#)).

Internationally, radiographers are taking on the responsibilities which were previously the exclusive preserve of radiologists. These responsibilities include reporting of radiographs, contrast injection and ultrasound scanning, amongst others. These additional responsibilities have been variously termed skill-mixing, role extension, role development or advanced roles (Hardy and Snaith, 2006).

Skill-mixing implies the utilisation of a radiographer's skill and expertise to complement or increase the expertise available to patients to improve the provision of health care to patients (College of Radiographers, 2005).

Hardy (2007) defines role extension as post-qualification acquisition of skills, responsibilities and the resultant associated level of additional professional accountability. The College of Radiographers (1997) in London (CoR) defines role extension as representing '*quantitative and qualitative change*' in the way radiographers contribute to patient management and health care services.

Radiography as a profession is developing and changing dramatically. These changes are mostly initiated by technological advances, automation, through the demand for change

driven by personnel shortages within the health care sector and the drive by government through policy change to improve provision of healthcare to patients.

### 1.5.1 Factors influencing development and implementation of role extension

The practice of radiography has seen tremendous advancement in the last two decades especially in the UK and most parts of the advanced world, this has affected the roles played by the radiographer (Smith and Reeves 2009). These advancements have been largely driven by an increase in workload (Department of Health, 2010 a), government policy (Department of Health, 2000 b) and compounded by a shortage of radiologists (Royal College of Radiologists, 2017).

In a study involving radiology managers across the UK about issues that had influenced the introduction of role extension in their various trusts, Price (2006) contends that managers raised issues in four broad categories. These categories were: radiologist shortage, increasing workload, radiologists' enthusiasm, and pressure and enthusiasm of radiographers. This was part of a larger study which he conducted for a PhD thesis entitled *Developing Practice in Radiography and Diagnostic Imaging* and it raised some pertinent issues. The initial barriers towards the introduction of role extension were grouped broadly as: opposition from radiologists, opposition from radiographers and shortage of radiographers.

### 1.5.2 Accuracy of radiographer reporting

Due to the presence of the factors enumerated above, there was a need for role extension to be introduced in the UK. However, the question of the ability of radiographers to perform to the same standards as radiologists needed to be answered in order to make a

case for role extension. To answer this, empirical studies had to be conducted. With plain radiograph examinations accounting for 54.6% of imaging studies (NHS, 2016) in the UK, this was a good area to start with as it constitutes a significant percentage of the work in diagnostic practice.

Brealey et al (2005) in a meta-analysis to determine how accurately radiographers report plain radiographs in clinical practice reviewed the literature from 1971, when Swinburne made his proposal that radiographers could be trained to interpret some radiographs, up to October 2002. Accuracy data were pooled using summary estimates of sensitivity, specificity and receiver operator characteristic curves. The results from this study showed that radiographers, when compared with a gold standard (consultant radiologist), can report plain radiographs in clinical practice at a sensitivity level of 92.6% (95% CI: 92.0 - 93.2) and at a specificity level of 97.7% (95% CI: 97.5 – 97.9). This meta-analysis also found studies that compared selectively trained radiographers of varying seniority against a reference standard, and showed no difference in accuracy in reporting accident and emergency plain radiographs between the radiographers and radiologists. Selectively trained radiographers were also found to report plain films from sources other than accident and emergency, as accurately as those from accident and emergency, although variations were found with different body regions. It also found that training improved the accuracy of radiographers especially when reporting normal radiographs.

### 1.5.3 Impact of role extension

In a study to investigate the impact of role extension in radiography on patient outcomes and health service quality, Hardy et al (2016) also performed a systematic review of the literature. This review found that emphasis was now also being placed on cost

effectiveness and inter-professional comparisons, which might be a sign of the professional priorities at the time that advanced roles were being introduced. It is also evident from this review that there is a possibility of significant cost reduction to the hospital as a whole through service redesign, role substitution and pay differentials. Patient morbidity was found not to increase with the introduction of radiographer reporting of trauma in musculoskeletal images, regardless of when the report became available. Treatment was not affected negatively either, although in one of the studies the introduction of immediate reporting by radiographers did reduce the number of false negative diagnoses and subsequent patient recalls. It can therefore be assumed that role extension could reduce patient morbidity as a result of improved clinical diagnosis and treatment. The review concludes that whilst there is some evidence of the positive impact of advanced roles for patient outcome, the evidence on service quality is very limited. The evidence available mainly suggests a positive contribution in terms of service efficiency, patient outcomes and acceptability.

## 1.6 Rationale of study

### 1.6.1 Research question

Ghana has 35 radiologists and ten administrative regions. The national shortage of radiologists is exacerbated by their uneven distribution (Fig 1.0) (Royal College of Radiologists, 2017). For example, Northern region accounts for 30% of the total land mass and 10% of the national population, (Government of Ghana. Northern, 2017) but currently has only two visiting radiologists (Royal College of Radiologists, 2017). Most radiologists are located in the southern capital city Accra and in the second city of Kumasi. The skewed distribution of radiologists is compounded for service users by the fact that those regions

ill-served by radiologists also have the lowest doctor-to-patient ratios. For example, the doctor-to-population ratio in greater Accra region in 2015 was 1:7,196, whilst the figure for Upper East region was 1: 30,601 (National Development Planning Commission, 2016). What compounds the situation is that all the radiologists are in the regional capitals, leaving the towns in the regions without radiologists. Without a good internet connection, remote reporting of radiographs is not an option. The demand for imaging services is on the increase coupled with the introduction of time-consuming modalities, like Computed tomography (CT scan) Magnetic Resonance Imaging (MRI) and interventional radiology. The supply of radiologists does not match the demand.

The net effect of gaps and inequalities in service provision is large numbers of unreported radiographs and overburdened doctors with inadequate training to interpret them. This results in patients being managed without the full diagnostic information, affecting the quality of healthcare. Figures are not currently available, but robust anecdotal evidence suggests that the majority of all radiographs taken in Ghana are unreported, with higher rates in regions with the lowest doctor-to-patient ratios. The MoH does not currently have a strategy directed at tackling the radiologist shortage. It costs approximately £4000 per annum to employ a senior radiographer in Ghana and £8,500 for a radiologist (Single Spine Salary Structure, 2018). Ghana, therefore, represents fertile ground for examining role extension opportunities; especially the radiographer's role in reporting.

There is therefore the need to conduct the present study to seek to answer the question:

**Are there opportunities for role extension in radiography in Ghana and if so how can these be harnessed to impact on the quality of radiological services and patient outcomes?**

### 1.6.2 Study aim

To use a case study approach to investigate if there are role extension opportunities in diagnostic radiography in Ghana and to explore the potential for role extension to positively impact on delivery of quality service to patients. The study will place more emphasis on the radiographer reporting an aspect of role extension as this is likely to generate the greatest impact in Ghana.

### 1.6.3 Objectives

To achieve the aim of the study, the objectives will be;

1. Review the current evidence of a radiologist shortage in Ghana;
2. Evaluate options for addressing shortages of radiologists in Ghana;
3. Identify opportunities for role extension in radiography in Ghana;
4. Determine how role extension might be implemented in Ghana successfully;
5. Identify factors that might facilitate or inhibit its implementation.

### 1.6.4 Summary

This chapter discussed a brief history of Ghana, her economy and the structure of healthcare. It also gave a brief history and the current state of radiology services in Ghana to provide the context in which the study is conducted. A contextual background of the study is discussed which includes the rationale behind the study and the study aims and objectives. The next chapter reviews relevant literature to guide the study.

## Chapter Two

### Literature review

#### 2.1 Introduction

This chapter examines the evidence available and aims to identify the gap in order to justify this study. The chapter will also outline the literature available in the areas of role extension in radiography generally with a focus on Ghana and Africa. It explores the historical perspective of role extension and factors that have contributed to the introduction of role extension. The chapter also discusses the ability of radiographers to perform various tasks to the same standard as radiologists and the impact of education on their performance. The barriers to role extension are also discussed.

#### 2.2 Historical perspective

Role extension in radiography has been extensively researched in most of the advanced world especially the United Kingdom (UK), Australia, Canada and the United States of America (USA). The same cannot however be said of Africa generally and Ghana in particular. Given that there are differences in the healthcare system of advanced countries and the developing countries like Ghana, especially in terms of resource and cultural issues, the research findings in advanced countries might not be wholly applicable in a developing country such as Ghana.

This chapter will be in two sections. The first section will give a historical perspective of role extension in radiography from the start of the profession to the late 1990s. This section will take a journey through the various phases of role extension in radiography. The second section will review relevant literature on role extension in radiography

generally. The concluding part of the second section will be a discussion of the literature which will identify the gap that necessitated this study.

Role extension is defined by Hardy and Snaith (2006) as the post qualification acquisition of skills, responsibilities and resultant additional professional accountability. It normally involves working across professional boundaries (White and McKay 2004). The main drivers of role extension are radiologist shortage, increase in workload without a corresponding increase in workforce, technology, service demands, modernisation and service redesign, professional aspirations and government policy globally (McPherson et al., 2006).

The invention of X-ray technology towards the end of the 19<sup>th</sup> Century, excited many individuals from varying professions. Many of these professionals decided to experiment with the new technology, notable amongst them were the engineers and physicists. Some of the professions known to have undertaken radiography are dentists, medical officers, pharmacists, photographers and hospital porters. The application of the new technology to medicine can largely be defined as 'free for all' at the time of its introduction (Price 2001).

Price (2001) contends, there was an emergence of two professional groups which included the medical radiographers or radiologists (as they are known) and the lay or non-medical radiographers which included everyone else apart from the medical officers. Radiologists and radiographers continued to be used interchangeably until the 1920s when the former became associated with the medical profession. This distinction was because of efforts of the medical profession to create a professional boundary which was mainly for prestige and status.



The pursuit of making X-ray technology a speciality by the medical radiographers continued and by 1917 most medical radiographers felt they were not being accorded the respect due to them. Thurstand Holland in an address at Liverpool University made two profound statements that exposed the way medical radiographers felt. He bemoaned the absence of radiology from the undergraduate medical curriculum.

*'The time is rapidly approaching when this subject (the teaching of radiology) will have to be added to the curriculum, when the unfortunate student already seems to be overburdened with lectures, classes and subjects, will have perforce to imbibe a certain amount of knowledge of X-ray diagnosis and treatment before he goes up for his final examination'*

The second statement exposed his frustration at the lack of recognition of the medical radiographer and his lack of regard for radiographers.

*'There is a prevalent idea abroad that a radiologist is a mere photographer, and that any medical man can interpret radiographs. Never was there a greater mistake. The techniques of plate taking can be easily acquired by anyone; the more experienced one has become in the interpretation of radiographic findings the more conservative one becomes, and more guarded in expressing dogmatic opinions.'*

Thurstand Holland, BMJ 1917: 288

Much earlier the BMJ claimed medical ownership of image interpretation and showed lack of respect for the work done by the radiographers in its 1903 issue:

*'There is no reason for professional prejudices against the practice of radiology by lay-men, so long as they confine themselves to the mere mechanical act of producing a picture and abstain from assuming scientific knowledge of their bearing of their radiographs on diagnosis or prognosis.'*

Anon, BMJ 1903; 831

This largely became the medical position. In the preface of a book entitled 'A manual of practical X-ray work' the authors Drs Arthur and Muir (1909) went beyond this position to state:

*'Three things are necessary to give radiology that position of reliability in professional work which it is surely, namely, good apparatus, intelligent and skilled use of such apparatus, and sound general medical training and experience to interpret and control results so obtained. The two former conditions are possible enough to operators outside the medical profession; the third is of its nature impossible to such persons, and the three cannot be efficiently separated. For a non-professional operator to offer a medical opinion on a radiogram is sheer impertinence'*

Arthur and Muir, 1909: v-vi

Larkin (1983) argues that radiologists were no longer the only ones with expertise in producing X-rays after the First World War. This therefore meant they could no longer base their expertise on the actual physical production of X-rays. Based on this assertion

the British Medical Association (BMA) became alarmed at the potential of many trained X-ray personnel who would be looking to establish themselves at the end of the First World War, the matter was therefore referred to their medico-political committee. The committee recommended that lay persons should not be allowed to practice unless under the direct instruction of a medical practitioner. The committee report elicited several responses, some of them very scathing. J.H.E (1917) suggested the practice of radiography by lay persons should be made a penal offence and laws passed to make it impossible for any such person to practice.

Later events showed the BMA was correct in its prediction that there would be many people trained with skills and techniques that hitherto were scarce. Price (2001) contends that attempts to exclude the lay radiographers from practice ceased after the First World War, however whether this was a real change in attitude or just a smart way out to the new reality is unknown.

Hernaman-Johson (1919) a prominent radiologist, who played an instrumental role in establishing the differences between a radiologist and a radiographer, had concerns about lay radiographers setting themselves up as independent practitioners. He proposed a three-fold solution, which was to organize and educate the lay helpers, give them remuneration and prospects that will make them content and most importantly educate the public about how valuable they are as helpers but extremely dangerous when they practice independently. He argued that it was too late for them to make a mystery of taking plates but *'the interpretation is ours forever'*.

Again, the British Association of Radiology and Physiotherapy (BARP) contacted the Institute of Electrical Engineers (IEE) on how to control the practice of lay radiographers.

This eventually led to the formation of a Society of Radiographers. Interestingly, Hernaman-Johnson was the secretary of BARP. It was therefore not surprising when later events showed there was a grand agenda behind the formation of the Society of Radiographers.

Price (2001) contends that the society sought and gained legitimacy by becoming incorporated. Having gained legitimacy, the society sought to promote the differences between the medical and non-medical radiographers. In a pamphlet that was reported in the Lancet the society wrote:

*'In order to put an end to the confusion with regards to the terms 'radiographer' and 'radiologist', it has now been generally agreed that the term 'radiologist' shall be applied to members of the medical profession who undertake radiographic diagnosis and treatment by means of X-rays and radium, while the term 'radiographer' be applied to their trained non-medical assistants'*

Lancet 1923: 416

The control sought by Hernaman-Johnson over lay radiographers was well and truly achieved and this was to continue for well over four decades (Price 2001). It took Swinburne (1971) who proposed that radiographers and other non-radiological staff could be used to differentiate between normal and abnormal films, to help reduce the radiologist workload. In justifying his suggestion Swinburne gave two reasons, 'there was a chronic shortage of radiologist' and that radiographers function below their potential. He further argued that recruitment will be improved, roles enhanced and that this could

lead to an advancement in the radiography career pathway at graduate level. Again, he contended that it was about time radiographers were officially recognised for assisting with image interpretation the world over. Importantly, he added, the radiologist and radiographer are interdependent and there is absolutely no need for a boundary dispute.

Despite the suggestions from Swinburne the status quo remained and in 1975 the British Journal of Radiology (BJR) published an editorial entitled 'Must radiologists do all the reporting?' (Anon, 1975), in the same edition a letter from a general practitioner (Emry-Roberts, 1975) sought to make the point that it was a waste of time for radiologists to attempt to report every image. These two drew some responses including the ones from Aberdour (1975) and McLachlan (1975) both of whom suggested that there was a role to be played by radiographers.

The possibility of a return to plain film reporting was very remote but a study by Cheyne et al (1987) on abnormality detection by radiographers, a system that became known as the 'red dot' system was launched. Radiographers were supposed to place a red dot on an envelope indicating that in the opinion of the radiographer the radiograph is abnormal. This system came with its challenges and limitations. It was voluntary so a radiograph without a red dot did not necessarily mean the radiographer did not find any abnormality. It could well be that the radiographer was not taking part in the red dot system. The presence of a red dot is also just an indication of the presence of an abnormality in the opinion of the radiographer, it does not give information on the site of the abnormality, the type of abnormality or its significance.

Interestingly, there was growing interest in the radiographer abnormality detection scheme in the early 1990s, consequently, Renwick et al (1991) conducted a study to

determine how well radiographers could triage films in an accident and emergency department. Unselected radiographers were to place films in one of four categories, normal, abnormal, significantly abnormal and need further assistance. This was independently compared with that of a radiologist. It was concluded that the radiographer could advise casualty officers on abnormality detection but their accuracy was not good enough to advance their role because of a rather high false positive outcome. The study was criticised by Nawrocki and Nawrocki (1991) who suggested that with training over a short period, radiographers had great potential in abnormality detection. Renwick agreed that radiographers should be given an opportunity for extra training and that his department was seeking funds for such a programme.

Rose and Gallivan (1991) conducted a study which involved sending questionnaires to all consultant radiologists in UK hospitals and 565 (45%) responded. The results from the survey were quite revealing, 16.1% reported all films, 33.6% said 10% or more films were never reported and one person said 90 % of all plain films were not reported. The two main reasons given for non-reporting of films were that firstly, patient management will not be affected without the reports and secondly a shortage of radiologists. The majority (58%) of the respondents were of the view that all films must be reported by a radiologist, 17% thought only films for dental and fracture clinic follow-up did not require reports. The remaining 25% did not provide any information. This study revealed the need to find alternative ways of ensuring that all radiographs are reported.

Saxton (1992) wrote an editorial in *Clinical Radiology* entitled 'Should radiologists report on every film?' he also raised a number of critical issues:

- Were all films being reported?

- Do reports get read?
- Reporting was too late to influence clinical management.
- Radiologists were becoming overloaded.
- He proposed that with careful training suitable radiographers could report on screening mammograms and fractures.

Workers at Leeds (Wilson, 1995) had financial support from the Department of Health (DoH) for its project 'The Extended Role of the Radiographer' which was based in Leeds College of Health and in conjunction with St James University Hospital. They decided to involve the College of Radiographers and Royal College of Radiologists in the steering group. The project was premised on failures or shortfalls in the existing framework of plain film reporting. A paper cataloguing these was submitted to the steering group. The failures and shortfalls described were;

25% of films were not reported

A subset of the unreported films included some clinically significant missed diagnoses

Reports were not issued quickly enough

It was costly to dedicate radiologists for immediate reporting (hot reporting), especially out of hours.

Meanwhile, at about the same time that the Leeds project was taking place, Loughran (1994) ran in-house training for radiographers in Macclesfield. The training, which lasted six months, involved three radiographers who specialised in orthopaedics and skeletal radiography at accident and emergency. They reported on films from accident and emergency and their accuracy was evaluated monthly. Their sensitivity for fracture

detection increased from 81.1% at the beginning of the training to 95.9% at the end and their specificity for fracture exclusion increased from 94.4% during the first two months to 96.6% in the final two months. He thus demonstrated that, with structured training, radiographers could report with consistently high levels of diagnostic accuracy comparable to scores recorded for radiologists.

The Audit Commission (1995) published a report on the effectiveness of radiology services across the UK. The report commented on a possible consideration of radiographers being trained to interpret certain images due to the difficulty that some departments encountered in providing a full reporting service. A survey on role development in radiography already showed that radiographers were issuing written reports in four hospitals in the UK (Paterson, 1995). Interestingly however, by the time the commission report was published some reporting courses were being developed in response to local needs. By the end of 1996, five higher education institutions were offering postgraduate qualifications in plain film reporting. These courses required validation and accreditation from the College of Radiographers (CoR), unfortunately this came with its own challenges, a radiologist member of the course team and another external advisor who was also a radiologist, were not comfortable with the possible consequences of validation. Of prime concern to them was the possible reaction from the Royal College of Radiologists (RCR), regardless of the findings from Wilson (1995) and Loughran (1994). The course team persevered and were eventually granted accreditation and validation by the CoR.

The Radiographers Board at the Council of Professions Supplementary to Medicine amended their statement of conduct in 1987 as a response to the changing role of the radiographer due to the emergence of ultrasound as a new role. This however did not



affect plain film reporting. This was soon to change. The CoR modified its code of conduct in 1994 to include radiographers being allowed to provide written comments to the referring clinician (CoR, 1994).

The RCR followed suit by stating their position in a statement which said non-medically qualified persons could report on films after suitable training, it however quickly added that a person without medical training cannot provide a medical interpretation (RCR 1995: 6).

This was a change in position by the RCR but strenuous efforts were still being made to distinguish between clinical observation and a medical report in their statement. This distinction is still very much a live issue as the RCR in a statement issued on 9<sup>th</sup> February 2017, on the radiology crisis in Scotland, reiterated it.

A vision statement from the CoR ended with a very emphatic declaration:

*‘Reporting by radiographers is not an option for the future, it is a requirement’*

College of Radiographers, 1997: 4

After both the RCR and CoR had stated their position on radiographer reporting, a group of radiographers and radiologists formed the Special Interest Group in Radiographic Reporting (SIGRR) in 1996. This was neither a professional nor a statutory body, but it brought prominence to the debate at a national level. The group has since been very instrumental in the development of radiographic reporting (Price 2001).

### 2.3 Summary

The practice of radiography has been through a number of phases as evidenced in the historical perspective. At the inception of the profession all those practising it were radiographers, then the medical practitioners sought distinction and called themselves medical radiographers whilst everyone else was a 'lay radiographer'. The next phase was when the medical radiographers sought to prevent the lay radiographers from practising in the profession. This continued for a while until they realised that many of the lay radiographers were skilled in taking radiographs.

The medical radiographers then sought to create a professional boundary by differentiating themselves from the lay radiographers and hence the name 'radiologist' was adopted for the medical radiographers and everyone else remained 'radiographer'. Then they also set out to prevent the radiographers from interpreting X-rays. This continued for about five decades.

However, with increasing workload, technological advancement, government policy, modernization of the healthcare sector and a shortage of radiologists the question of radiographer role extension generally, but particularly in terms of radiographer reporting, became a key issue. This eventually led to the red dot system which eventually evolved to radiographer reporting. Through it all the RCR still maintains that anyone without medical training can only provide clinical observation but not a medical report.

### 2.4 Empirical Literature Review

As mentioned earlier, the second section of this chapter will review relevant literature.

### 2.4.1 Search strategy

The first phase of this study was to review the available literature. To achieve this an in-depth search was conducted to determine the evidence available on radiographer role extension across the world generally but with specific emphasis on Ghana.

The aim of this search was to explore all the available evidence on role extension in radiography globally and also to look for African and Ghanaian parallels. Therefore, the literature search set out to gain an overview of the available literature globally and also to draw parallels from Africa and Ghana, on role extension in radiography generally. The review will help the researcher gain an overview of work that has been done on role extension in radiography to date which will help shape this study.

### 2.4.2 Methodology

The search had to be comprehensive in order to cover all the possible terms that are important to the aim of the study. The relevant synonyms and terms critical to the aim of the study were included in the search. The search comprised the following phases: identifying, assessing and selecting the relevant literature.

To conduct the search the researcher created two concepts, namely role extension and radiography.

An in-depth systematic search was conducted using the following databases: Cumulative Index for Nursing and Allied Health Literature (CINAHL), SCOPUS, Medline via Ovid, Web of science, and Google scholar.

Concept 1

Concept 2

Radiography	Role extension
Radiographer Radiologic technologist Radiologic technician X-ray technician Medical radiation technologist Radiologist assistant	Role expansion Role development Advanced roles Advanced practice Skill mix Radiographer reporting Role boundaries Professional boundaries Non-medical consultants Specificity and sensitivity Red dot

Table 2. 1 Terms used in literature search

The terms used in the two concepts are as listed in Table 2.1.

These databases were selected based on relevance to the area of research. Other sources of literature which were searched included books, policy papers from government, academic journals such as Radiography and references from articles retrieved. The search was not limited by time. This was done to enable the researcher to retrieve as much historical material about role extension as possible since this would provide the literature needed to write the historical perspective section. The search was limited to papers written in English but no geographic limitation was applied.

The terms in each concept were combined using the Boolean OR and concept 1 and concept 2 were combined using the Boolean AND. The same terms were used across all databases.

**Assessment and selection** –The titles and abstracts of retrieved articles were assessed and a decision of relevance to the study based on the objective was made. The full text of all articles selected based on their title and abstract were retrieved. The criteria used to determine eligibility included: literature about role extension in radiography and factors that influence the introduction of role extension in radiography, benefits of role extension in radiography, its impact on patient care, challenges with implementation and accuracy of radiographer reporting. The objective of the researcher in doing this review was to get an idea of the work that has been done in the area, identify the gap that may exist in the body of knowledge and proceed to further investigate and possibly fill the gap that exists. References for all articles retrieved were checked for papers that meet the inclusion criteria but might have been missed in the initial search. All selected articles were read and findings were grouped into themes. These themes will inform the literature review. De-duplication of articles was done for articles that were found in more than one database. A total of 36 papers were retrieved; 30 of them were empirical, 6 were narrative or policy papers.

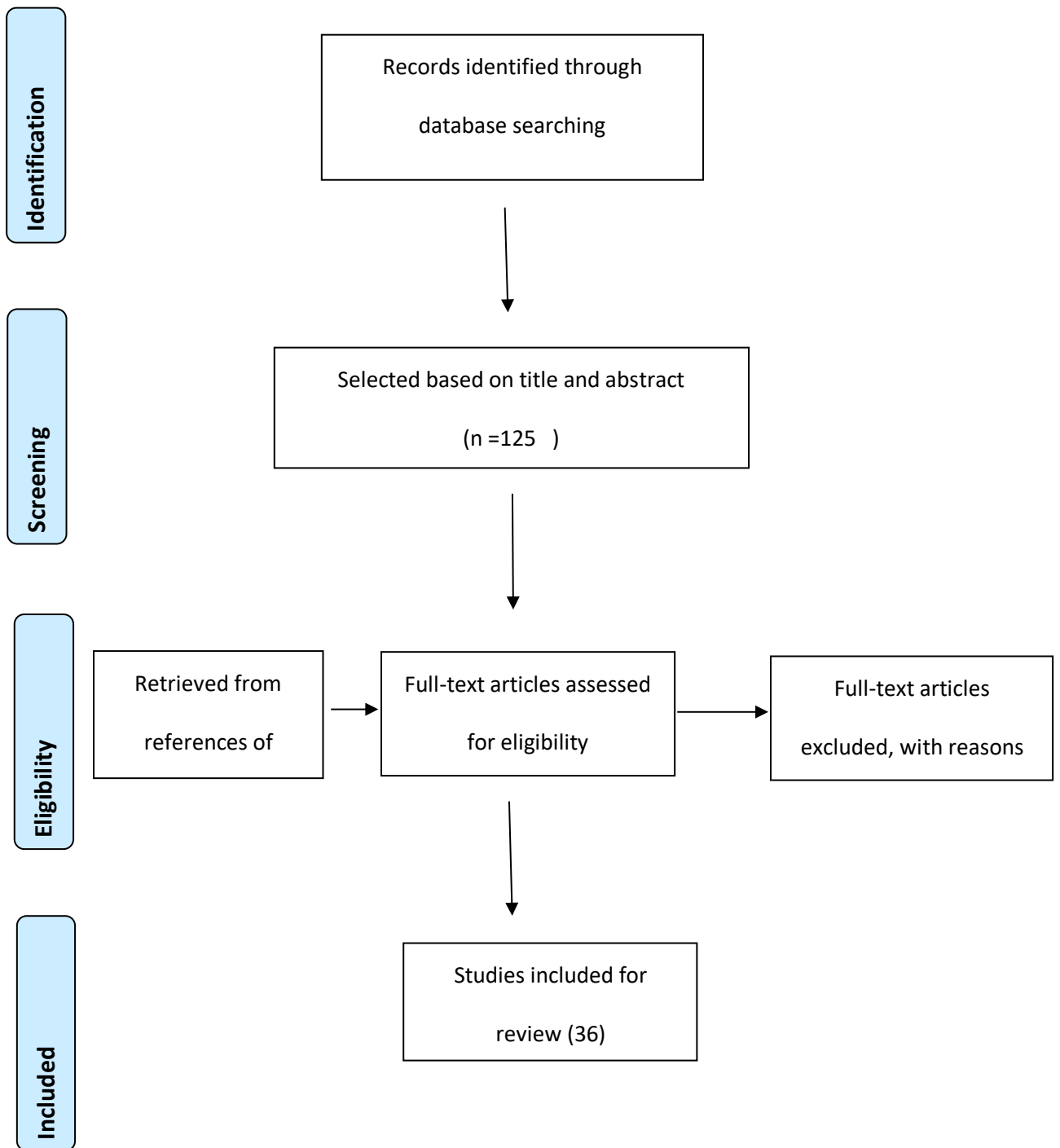


Figure 2. 1 Prisma diagram of literature search

## 2.5 Empirical literature review

This section includes a discussion of the existing empirical literature on role extension in radiography. A thematic analysis was conducted whilst reviewing the literature and a number of themes emerged. These are (a) factors influencing the development and implementation of role extension (b) can radiographers perform it to the same standard as radiologists and does education impact performance and (c) scope of practice. A critical review of the findings from the empirical studies is presented according to the themes stated above.

### 2.5.1 Factors influencing the development and implementation of role extension

Price (2007) interviewed radiology managers across the UK about issues that had influenced the introduction of role extension in their various trusts. This was part of a larger study conducted for his PhD thesis entitled *Developing Practice in Radiography and Diagnostic Imaging*. The study found the factors that had led to the introduction of role extension included: Radiologist shortage, increasing workload, radiologist enthusiasm and radiographer pressure and enthusiasm. The shortage of radiologists was identified as being the main reason for introducing role extension. In most cases the roles were taken up because the shortage in radiologists had resulted in the department not being able to cope with the increasing workload. With the shortage of radiologists and confronted with an ever-increasing workload in imaging services, the departments were no longer able to cope with the pressures and complaints from patients so they had to find solutions, enthusiastic radiographers were encouraged to take up new tasks.

Price (2007) reports that all the managers interviewed reported an increased workload resulting from a shortage in radiologists and an increased demand for imaging services. This therefore led to longer waiting times for patients and with it came complaints from the patients. This led to radiographers being delegated new tasks that were previously in the domain of radiologists. The taking up of these new tasks helped to reduce patient waiting times (Price, 2007).

A common theme that ran through the interviews with the managers was that mostly there was at least one supportive radiologist who was interested in role extension. It was also quite obvious that without the support of radiologists it would have been very difficult to introduce role extension in the various trusts. However, there is a counter argument that it was not really so much about radiologists' enthusiasm but rather that some of the tasks were no longer attractive to the radiologists hence the support for radiographers to take them up (Price, 2007).

Radiographer enthusiasm and pressure towards the implementation of role extension had been a result of its introduction in some trusts, this served as an incentive to boost the enthusiasm of radiographers. This then led to radiographers applying pressure for its introduction. Some interviewees reported radiographers, who had previously worked in trusts where role extension was in practice, asking questions such as why could they not take up roles they had undertaken at their previous workplaces. The pressure from this contributed to the gradual introduction of role extension in those trusts. In most of the trusts radiographers were not forced into the new roles, it was their initiative and they pursued it (Price, 2007).



Kelly et al (2008), in a review of the literature, established the factors that influenced the development and implementation of extended roles and included radiological skills shortages as one of the main factors. The shortage in radiologists had resulted from an increased demand in imaging services exceeding the number of radiologists trained and they could not keep pace with the workload. The situation therefore required innovative ways to continuously provide the image services required by patients, hence the introduction of role extension. Kelly et al (2008) also argued that there was an increase in demand for imaging services including time-consuming interventional procedures and image-guided treatments. This, therefore, did not only increase the workload but also involved time consuming procedures such as interventional imaging.

Furthermore, Page et al (2014) found the factors accounting for the introduction and implementation of extended roles in Australia to include radiologist shortage as one of the core factors influencing the introduction of role extension. The study is limited by the fact that the participants were all radiographers with an interest in advanced practice. The perspective of other key stakeholders like radiologists, physicians and government were not sought.

The shortage of radiologists is still a live issue today as the clinical radiology workforce report 2018 showed that about 75% of clinical directors of UK radiology departments felt there were insufficient clinical radiologists to provide safe and efficient patient care (RCR, 2018). Again, a statement from the RCR in February 2017 admits that a radiology workforce crisis existing in Scotland is currently worsening. It is unlikely whether radiographers would have been allowed to take up roles that have traditionally been within the realm of the radiologists without a shortage of such roles. This is especially so

given that even though the RCR in its February 2017 statement admits there is a radiology workforce crisis in Scotland which is getting worse, they are still against radiographer role extension. They preferred foreign radiologists being brought in to augment their numbers, even though the shortage of radiologists is not limited to the UK and the developed world.

The situation in the developing countries is even worse as Okeji (2012) shows in a study to appraise the reporting of trauma images in secondary and tertiary centres in Nigeria. The study found only 33% of the hospitals surveyed had resident radiologists, 22.5% had a visiting radiologist. The remaining 44.5% had neither a resident nor a visiting radiologist. The study also reported it took between 24 and 72 hours to have accident and emergency radiographs reported at the surveyed hospitals. The study concludes that the delay in reporting of trauma radiographs has increased both mortality and morbidity in the surveyed hospitals and also that the delay in reporting and the huge percentage of unreported radiographs was a result of a radiologist shortage. Even though the study covered all the six geo-political regions of Nigeria, it had a small sample size. For each region two tertiary and two secondary centres were selected. These numbers were relatively small compared to the number of centres each region has. The study participants were comprised of nurses and radiographers which is a limitation. The involvement of emergency physicians and radiologists could have provided a different perspective as well.

Similarly, Buchan et al (2000) in a study for the World Health Organization (WHO) to highlight the various factors that come into play when considering skill mix amongst others, identified staff shortages as one of the key factors for skill mixing or role extension.

Even though the study was not specific to radiography, but applied to healthcare generally, it is still relevant to this study.

In 2002, the RCR argued that at the current rate of increasing workload, there was a need to double the number of posts just to keep up with the current workload alone, without taking into account future growth. Clearly, there was a shortage in radiologists which was further compounded by the increasing workload and these served as factors for the introduction of role extension or advanced roles.

Similarly, Williams (2009), in a study conducted in the Western Cape area to ascertain whether South African radiologists would support role extension of radiographers into reporting of musculoskeletal trauma and emergency plain radiographs, concluded that most (68%) of the respondents indicated their willingness to support role extension. However, the nature of support they were willing to offer varied, the majority (54%) were willing to provide support in the area of assessing clinical competence, 38% as clinical mentors, 32% as supervisors and 26% were willing to offer academic support in the form of lecturing. The study had a response rate of 44.8%.

### 2.5.2 Barriers to role extension

Even though there is support from some radiologists, there were a number of radiologists that were opposed to role extension. One manager reports on two radiologists who literally said that role extension would only be introduced 'over my dead body' (Price, 2007). The level of resistance and opposition was fierce in some instances. Some radiologists claimed role extension would undermine the training of junior radiologists. One of the areas of concern was with barium enema because they felt it would affect the

training of junior radiologists once it was being performed by radiographers. This concern, however, turned out to be without basis as the radiographers became a good resource in teaching the junior radiologists. Rather than being a barrier, role extension in this instance was of great benefit. Some of the managers also felt that radiologists were just anxious about their own roles. The managers, however, felt the opposition from radiologists was not an impossible barrier to overcome once there was at least one supportive radiologist committed to supporting role extension (Price, 2007).

Henderson et al (2016) contend that the lack of support, and in some cases opposition from radiologists, is one of the major barriers facing the introduction of role extension in Scotland. A position that is shared by Forsyth and Robertson (2007).

A few trusts reported radiographers themselves serving as barriers. They simply did not show any interest in role extension and did not want to be a part of it. They feared the responsibility that came with taking up new tasks and they were simply not ready for it. Another reason was that if there was no remuneration for the additional responsibility then they were not willing to take part. Also, there were some senior radiographers who were unwilling to take up the new roles because they were not very confident and wanted to maintain the status quo and it was not possible for the junior ones to take up these roles (Price, 2007).

The issue of radiographer shortage was of concern to the managers. This would especially be true if radiographers did extend their roles, there would not be anyone to fill the places they had left to take up the new roles. This served as a further barrier to role extension (Price 2007).

### 2.5.3 Can radiographers perform to the same standard as radiologists and does training (Education) impact performance?

Due to the presence of the factors enumerated above, there was a need for role extension to be introduced. The question of the ability of radiographers to perform to the same or similar standards, or even better than radiologists, had to be answered to make a case for role extension. There are some studies into the accuracy of radiographers compared to radiologists in the various tasks they take up. This section would be reviewed under six categories namely;

- Red dot accuracy
- Plain film reporting accuracy
- Screening mammogram accuracy
- Chest X-ray reporting accuracy
- CT scan reporting accuracy
- MRI reporting accuracy

#### *2.5.3.1 Red dot accuracy*

Red dot is an abnormality flagging system whereby the participating radiographer places a red dot on an image that appears abnormal to them. It is a voluntary system and comes with its challenges which have been mentioned earlier. Red dot was introduced in the very early stages of role extension and because of its widespread use there was a need to study how accurately it was being done.

Brealey et al (2006) undertook a systematic review of literature starting from 1971 where possible to coincide with Swinburne's proposal and ending in May 2005. The review

showed that radiographers' red dot of accident and emergency radiographs in clinical practice compared with a reference standard is 0.87 [95% confidence interval (CI) 0.85–0.89] and 0.92 (0.91–0.93) sensitivity and specificity, respectively. Radiographers' triage of A&E radiographs of the skeleton is 0.90 (0.89–0.92) and 0.94 (0.93–0.94) sensitivity and specificity, respectively; and for chest and abdomen is 0.78 (0.74–0.82) and 0.91 (0.88–0.93) respectively. Radiographers' red dot of skeletal A&E radiographs without training is 0.71 (0.62–0.79) and 0.96 (0.93–0.97) sensitivity and specificity, respectively; and with training is 0.81 (0.72–0.87) and 0.95 (0.93–0.97). Pooled sensitivity and specificity for radiographers without training for the triage of skeletal A&E radiographs is 0.89 (0.88–0.91) and 0.93 (0.92–0.94); and with training is 0.91 (0.88–0.94) and 0.95 (0.93–0.96). The study concluded from the review that radiographers red dotting or triage of accident and emergency radiographs is affected by the body part being reported but not by training in clinical practice.

Orames (1997) and Smith and Younger (2002) both studied the ability of radiographers, without training on image interpretation, to identify abnormalities on a radiograph. The studies found the accuracies to be 85% and 93% for Orames (1997) and Smith and Younger (2002) respectively.

### *2.5.3.2 Plain film reporting accuracy*

In the UK plain film examination accounts for 54.6% of imaging studies (NHS, 2017). This is not very different globally. Plain radiograph reporting therefore is a very important part of practice as it constitutes a great percentage of the work in diagnostic practice.

Brealey et al (2005), in a meta-analysis to determine how accurately radiographers report plain radiographs in clinical practice, reviewed literature from 1971 when Swinburne

made his proposal up to October 2002. Studies were identified using electronic sources, back chaining of references from articles, hand searching of journals and by personal communication. For a study to be eligible, it must have assessed plain film reporting by radiographers in a clinical setting and compared it with a gold standard. It should also be possible to provide accuracy data for a 2 X 2 contingency table. Accuracy data were pooled using summary estimates of sensitivity, specificity and receiver operator characteristic curves. The results from this study showed that radiographers, compared with a gold standard, report plain radiographs in clinical practice at a sensitivity of 92.6% (95% CI: 92.0 - 93.2) and a specificity of 97.7% (95% CI: 97.5 – 97.9). This meta-analysis also found studies that compared selectively trained radiographers of varying seniority and radiologists against a reference standard, showed no difference in accuracy in reporting accident and emergency plain radiographs between the radiographers and radiologists. Selectively trained radiographers were also found to report plain films from sources other than accident and emergency as accurately as those from accident and emergency, although variations were found with various body parts. Training also improved the accuracy of radiographers especially when reporting normal radiographs.

In a study to assess selectively trained radiographers and consultant radiologists reporting of plain radiographs from accident and emergency and general practitioners (GP) within a hospital setting, Brealey et al (2005) involved two radiographers, eight consultant radiologists and a reference standard radiologist. They independently reported retrospectively selected random stratified 400 accident and emergency and 400 GP plain radiographs under controlled conditions. An independent consultant radiologist judged whether the reports by the radiographer and the radiologist agreed with the reference

standard. Clinicians assessed whether the incorrect reports from the radiographer and radiologist affected their confidence in the diagnosis and treatment plans of the patients and how it impacted on patient outcomes. The results from the study showed that for accident and emergency (A&E) and GP plain radiographs respectively, there was a 1 % (95% CI – 2 to 5) and 4 % (95% CI – 1 to 8) difference in reporting accuracy between the two professions. There was an 8% confidence interval for both A&E and GP cases in the clinician's confidence in their diagnosis based on the radiographer or radiologist incorrect reports. There was a 2% and 8% difference in the clinician's confidence in their management plans based on the radiographer or radiologist incorrect reports for A&E and GP respectively. For the clinician's confidence in patient outcomes based on radiographer or radiologist incorrect reports, there was a 1% and 11% difference for A&E and GP respectively. The study concluded there is potential to extend reporting of trained radiographers to include A&E and GP patients. This study, like the meta-analysis by Brealey et al (2005), contends that radiographers can interpret radiographs accurately and their performance improves with the requisite education. The study was however conducted in a single site and the sample size of participants was small.

Piper et al (2005) in confirming the ability of radiographers to interpret plain radiographs accurately, conducted a study that tested for significant differences in sensitivity, specificity and or accuracy between cases from A&E and other referral sources reported by radiographers. Results achieved by radiographers on a postgraduate course for appendicular and axial skeleton, in objective structured examinations (OSEs) by three cohorts who studied in a university college between 1995 and 1997 were analysed. Each radiographer reported on an OSE bank of 200 plain film examinations of the



musculoskeletal system as part of their final assessment of the postgraduate course. The responses were scored using pre-determined answers and true positive/negative and false positive/negative fractions were allocated which then made it possible to calculate sensitivity, specificity and accuracy. The mean values calculated from the actual OSE scores were very high with 91.6% - 96.7% sensitivity 92.1% - 94.0% specificity and 91.8% - 93.7% accuracy. The study also concluded that upon detailed statistical analysis there was no significant difference in accuracy between A&E and non-A&E cases. This study, however, was in a single centre and there is a need to conduct a multi-centre study to confirm the findings. Again, OSE conditions are not the same as in clinical practice which could be another weakness of the study.

Similarly, Plesis and Pitcher (2015) in a prospective study conducted in an African setting (South Africa) compared the accuracy of medical officers and senior radiographers in acute trauma radiograph reporting. Medical officers and senior radiographers reported on appendicular skeletal trauma radiographs from November 2013 to April 2015. Their reports were compared with the reference standard who was a consultant radiologist and the sensitivity, specificity and accuracy were calculated. When the differences were evaluated, the senior radiographer had higher accuracy and sensitivity (81.5 % vs 67. %  $p = 0.002$ ) than the medical officer. The study therefore concluded that senior radiographers were a potential source of trauma reporting in Africa. The study is however a single centre study and the time allocated (30 seconds) to the participants to interpret each radiograph was rather short. This is justified by the authors by stating that was the time allocated for the rapid reporting section of the final fellowship examination of the college of radiologists in South Africa at the time. However, under clinical conditions one

is not expected to report an image in 30 seconds. Additionally, the study could not be conducted in a clinical setting as radiographers are not allowed to report on radiographs in clinical practice in South Africa.

Additionally, Coleman and Piper (2009) assessed how accurately and confidently casualty officers, nurse practitioners and radiographers working within the emergency department (ED), identify and describe trauma on radiographs within an imaging test bank of 20 appendicular images. The study involved 7 casualty officers, 13 nurse practitioners and 18 radiographers. The images from the test bank were all acquired following trauma and contained subtle yet clinically significant abnormalities. The maximum score was 40 marks. The reports from these 3 professional groups were compared with the reference standard. Various statistical tests were run on the scores to assess the overall performance of diagnostic accuracy of each group and the variation in performance between groups to test for significant statistical differences in performance in interpretation between the groups. The results showed that radiographers attained the highest mean test bank scores (28.5/40 71%) which was statistically higher than the results by the nurse practitioner (21/40 53%) and casualty officer (21.5/40 54%). However, the results from the nurse practitioner and the casualty officer showed no significant difference. The study therefore concluded that radiographers were able to utilize their knowledge in image interpretation to assist with initial interpretation at the ED. The study is a single site study which limits the possibility of generalizing the results. There is also a possibility of selection bias with the use of test bank images. It might not represent what actually happens within clinical practice.

Buskov et al (2013) in a study conducted in Denmark, compared diagnostic accuracy of radiographers who had postgraduate training in reporting of the appendicular skeleton and radiologists' trainees with whom they work in reporting emergency department radiographs. Each group reported on 500 plain radiographs of the appendicular skeleton. These radiographs were collected from 1000 consecutive emergency room patients over the period September 2010 to January 2011. These reports were compared to the final report produced by a consultant radiologist in agreement with an orthopaedic surgeon. Two observers then classified the reports produced by the radiographers and trainee radiologists as true positive/negative or false positive/negative when compared to the reference standard. Incorrect primary reports were graded according to three categories to evaluate their level of clinical significance. Statistical analysis was done to compare the differences and associations between the two groups with respect to plain film reporting. Radiographers achieved a sensitivity of 99% compared with the trainee radiologist 94% and a specificity of 97% compared with the trainee radiologists 99%. Interestingly, radiographers missed a significantly smaller number of fractures ( $n = 2$ ) than trainee radiologists ( $n = 14$ ) but tended to overcall. The study concluded that radiographers can report accident radiographs of the appendicular skeleton with high accuracy and present a resource that can be used to help meet the increasing workload and demands in quality service. The study had sufficient radiographs for the study, however with just two radiographers and four trainee radiologists in a single site study, the results can hardly be representative of the population of the two professions in Denmark.

### *2.5.3.3 Mammography reporting accuracy*

Breast cancer is the leading cancer for women across the world. Early detection increases the chances for survival. There is therefore a growing demand for mammograms which comes with increased pressure on radiologists for reporting. This has brought about the need for additional hands in helping the radiologist to meet the increasing workload resulting from more and more women taking part in breast screening programmes.

Moran and Warren-Forward (2016) conducted a study to assess and compare the diagnostic outcome of mammograms reported by radiographers in order to screen readers in a mammogram screening programme in Australia. Six radiographers were involved in the prospective study which was undertaken between 2010 and 2011. Each participant reported on 2000 mammograms. Their reports were then compared with that of the current screen readers who are radiologists. Statistical analysis of the results was performed and this included cancer detection rates, recall rates, levels of agreement, kappa, specificity, and accuracy, positive predictive and negative predictive value. The percentage of cancer detection by the radiographers ranged from 53% to 100% of that of the radiologist. Whilst the radiologists had a recall rate of 3.4 % to 5.5%, the radiographers had 2.9% to 9.8%. The level of agreement was from 90% to 96%. The study therefore concluded there is potential for high accuracy of Australian radiographers in screen reading and that implementation of formal training is likely to result in an increase in diagnostic accuracy of radiographers. The study had a small sample size and it was a single site study. This makes its generalizability impossible. Again, due to the prospective nature of the study it was not possible to calculate the number of false negatives of the reference standard, so it was assumed the reference standard was 100% correct.

Similarly, Debono et al (2015) conducted a study amongst Australian radiographers aimed at evaluating their accuracy on screen-reading mammograms. Ten radiographers, working in a breast cancer institute with varying years of experience, were recruited to independently screen read a test set of 500 mammograms. They had no training in screen reading and were to indicate the presence of an abnormality using BI-RADS. Their accuracy was determined by the gold standard which was known pathology results, interval matching and client's 6-year follow up. The study concluded that this sample of radiographers, in an Australian setting, had adequate accuracy levels when screen-reading mammograms. It is expected that accuracy will increase with formal training and with support radiographers could become one of the two screen readers in breast screening. The study method was robust as the gold standard was based on pathology results, patients 6-year follow up and interval matching, the number of radiographers was however small as well as the number of mammograms each radiographer was to read.

Additionally, Moran and Warren-Forward (2011) in a follow-up study to a pilot, which showed early results of radiographers reviewing mammograms with similar accuracy to screen-readers in Australia, recruited 7 radiographers and 2 current official screen-readers. The study used 250 sets of mammograms from 2003. The participants reviewed each set of mammograms as a rescreen or a recall. Patient outcomes were assessed by following up either histology or pathology tests in 2003 or 2005/2006 screening results. The screen-readers had sensitivities ranging from 79% to 93% and specificities from 82% to 84% whilst radiographers had sensitivities of 57% to 97% and specificities of 63% to 80%. The study concluded that the sensitivity and specificity figures attained by some radiographers were equivalent to those of both screen-readers. The accuracy rates of

radiographers suggest selected and appropriately trained radiographers can screen read mammograms in Australia. The study was a single site study, with a small number of radiographers and an equally small number of mammograms.

Equally, Moran and Warren-Forward (2016), in a systematic review, evaluated radiographers' performance in assessing mammograms and compared it with radiologists. They also documented the level of training in mammogram reading attained by the radiographers. Most of the literature reviewed demonstrated that radiographers' performance was equivalent to that of the radiologists' readers. Even though formal training was shown to improve the sensitivity of radiographers, the results show there was no statistical difference at 95% between trained and untrained radiographers and radiologists.

#### *2.5.3.4 Chest X-ray reporting accuracy*

Piper et al (2014), in a study, analysed the objective structured examination (OSE) results of the first six cohorts of radiographers who had successfully completed an accredited postgraduate course in clinical adult chest reporting. The OSE included 100 chest radiographs with varying abnormal cases and also some normal cases. The responses were graded by using true/false positive and negative fractions, these were then scored against the gold standard which was agreed on by three consultant radiologists. All six cohorts produced mean sensitivity of 95.4% (95% CI 94.4% - 96.3%) and specificity of 95.9% (95% CI 94.9% - 96.7%). Their mean agreement rate was 89% (95% CI 88.0% - 89.0%). The study concluded that the OSE results suggest this group of radiographers following an accredited postgraduate education programme in an academic environment, were capable of identifying normal chest radiographs and also capable, to a high standard, of

providing a report on abnormal appearances. They were also able to report on a broad range of chest pathologies with satisfactory accuracy under examination conditions. It is critical to note the study was conducted under examinations conditions which are not the same as clinical conditions. Again, there is also an assumption by the researchers that the errors made by the radiographers are likely to be similar to those made by consultant radiologists of varying experience. The basis upon which this assumption is made is unclear as it has not been stated.

Similarly, Woznita et al (2014) examined the performance of radiographers in reporting adult chest radiographs in clinical practice using different audit systems. This might include a single radiologist or two radiologists, with clinical review in discordant cases. A random selection of 100 chest radiographs from a consecutive series of 4,800 chest radiographs over a period of nine months was used. Three consultant radiologists were used as gold standard, each reporting independently of the other. They had 50% of the radiographs duplicated so that more than one radiologist reported on about 50% of the cases. They were blinded from which particular radiographs were being reported by more than one radiologist. Agreement rates were determined for radiographer-radiologist and radiologist-radiologist interpretation. The results of the study showed 99 cases were reviewed and of this number, 40 cases were considered abnormal by at least one radiologist. There was agreement with the radiographers' report in 59 normal cases and 33 abnormal cases reviewed by two radiologists (96.7% and 86.8% respectively). Seven reports were discrepant with clinical review. The agreement between the radiographer and each radiologist was very high with figures of 96%, 96% and 92%. The study concluded that radiographers could report chest radiographs with high concordance with consultant

radiologists. The study is limited both by the single radiographer used for the study and also by the fact that it is a single site study. The radiologists were not blind to the reports produced by the radiographer prior to producing their reports. This may have influenced their decision.

Additionally, Ekpo et al (2015), in a study to assess the performance of Nigerian radiographers in the interpretation of chest radiographs and also whether age, length of practice or sector of practice affected performance, involved 51 radiographers from both the public and private sector in Nigeria. Fifty chest radiographs with 23 normal cases and 27 cases with various cardiopulmonary conditions independently confirmed by 3 radiologists were used. These chest radiographs were presented to the participants in a random order and they were asked to evaluate the radiograph for presence or absence of an abnormality, identify its location, radiographic features and make a diagnosis. The participants were also to indicate their age, years and sector of practice. The results were subjected to statistical analysis and age was found not to be associated with performance, but length of practice and private practice were positively associated with practice. Mean location sensitivity was 88.9% (95% CI 0.787 -0.980), whilst mean sensitivity and specificity was 76.9 (95% CI, 0.658 – 0.864) and 79.8 (95% CI 0.658 – 0.864) respectively. The study concluded that Nigerian radiographers were able to interpret chest radiographs to a very reasonable standard compared to their colleagues in South Africa and that performance is associated with numbers of years of practice and also sector of practice. The number of chest radiographs reported was small, but the number of radiographers involved in the study was 51 which was good. However the sensitivity of 76.9 (95% CI, 0.658 – 0.864) and specificity of 79.8 (95% CI 0.658 – 0.864) is quite low but given that the participants had



not received training in image interpretation, it is possible that education might improve their accuracy.

#### *2.5.3.5 Computed Tomography (CT) and Magnetic resonance imaging (MRI) reporting accuracy*

Computed tomography (CT) examination reporting by radiographers is still evolving in the UK. A Society and College of Radiographers (SCoR), (2012) survey established at least 17 sites in the UK were supporting this role extension.

A study by Lockwood et al (2015) evaluated the summative OSE results of the first four cohorts of radiographers undertaking an accredited postgraduate course in reporting head CT radiographs. The OSE contained 25 head CT examination that had 1:1 normal to abnormal pathologies. All the cases were reported by 3 consultant radiologists blinded from each other's reports. This was then used as the reference standard for comparison with the radiographers' reports. The results of the radiographers were analysed to determine their sensitivity, specificity and agreement value and how concordant the four cohorts were. The collective scores of the four cohorts (2007 – 2013) produced a mean sensitivity and specificity rate of 99% and 95% respectively and a concordance rate of 90%. The study concluded that within an academic setting trained radiographers do have the ability to report CT head examinations with high levels of diagnostic accuracy. The study was a single site study and was not conducted in a clinical setting. A multi-centre study in a clinical environment would now be desirable.

Additionally, Lockwood and Piper (2015) conducted a preliminary small-scale study to assess the diagnostic performance of a limited number of radiographers and consultant radiologists in clinical practice reporting head CT. The study used a multiple reader

multiple case (MRMC) and alternative free response operating characteristic (AFROC) methodology. An image test bank of 30 head CT examinations were used with a ratio of 1:1 normal to abnormal cases. A reference standard was established by double reporting the original report by two independent consultant radiologists. Arbitration in cases of discordance was carried out by the researcher. The results were compared for sensitivity, specificity, accuracy and agreement. The radiographers demonstrated a mean sensitivity rate of 88.7% (95% CI 82.3% - 95.1%), specificity 95.6% (96% CI 90.1 – 100%) and accuracy of 92.2% (95% CI 89.3 – 95%) whilst the consultant radiologist had a mean sensitivity rate of 83.35% (95% CI 80 – 86.7%), specificity 90% (95% CI 86.7 – 93.3%) and accuracy of 86.65% (95% CI 83.3 – 90%). The study concluded that a small group of radiographers demonstrated high levels of diagnostic accuracy reporting head CT examination, equivalent to a small group of consultant radiologists. A multi-centre study with a much higher number of participants would be more robust.

However, Meertens et al (2013) undertook a systematic review to assess the accuracy of radiographers in providing written reports on intraluminal disease entities of computed tomography colonography (CTC) compared to a reference standard. Pooled estimates of sensitivities and specificities and a chi-square test of heterogeneity were calculated. Pooled estimates from 3 studies showed per patient sensitivity of 76% (96% CI 70 – 80%) and specificity 74% (95% CI 67 – 80%) for radiographers. Seven studies had per lesion sensitivity of detection of lesions >5 and >10 mm was 68% (95% CI 65 – 71%) and 75% (95% CI 72 – 79%) respectively. Radiographers reporting 50 or less cases had lower sensitivities and specificities. The study concluded that the results do not support radiographers being involved in single formal written reports of CTC. The results however

did improve significantly with the number reported. It is therefore very likely that with the right education, training and experience there is potential for radiographers to report CTC.

In contrast, Piper et al (2010) analysed OSE results of the first three cohorts of radiographers who completed an accredited postgraduate certificate in general MRI reporting and to compare concordant rates with a small group of consultant radiologists. The OSE made use of 40 MRI examinations which included knee, lumbar spine and internal auditory meatus (IAM). Sensitivity, specificity and total percentage agreement rates were calculated for all radiographers by using all the reports (n = 1560). A subgroup (n =27) of reports was compared with the three consultant radiologist reports produced whilst constructing the OSE. Kappa values were calculated to measure agreement in all groups. Consultant radiologists only; radiographers and each of the consultant radiologists independently. The combined sensitivity, specificity and agreement rates of the 3 cohorts of radiographers were 99.0% 99.0% and 89.2% respectively. For the majority of the anatomical areas, there was no significant difference in the kappa scores for the different groups, regardless of whether the radiographers were included in the group analysis. Where there was a difference it was in a minority of the cases, the variation was either not greater than between radiologists and/or of no clinical significance. The study therefore concluded that this group of radiographers, under academic conditions, can report on abnormal appearances to a high degree of accuracy and also correctly identify normal images. This study aside from being in an academic setting, which is not the same as a clinical setting, was a single site study and had a small number of participants.

Brealey et al (2013) assessed the agreement between trained radiographers and consultant radiologists compared with an index radiologist when reporting MRI of the

knee and lumbar spine and the subsequent effect of discordant reports on patient management and outcomes. The study involved two MR radiographers, two consultant radiologists and an index radiologist who reported a random sample of 326 MRI examinations prospectively. The radiographers reported in clinical practice conditions whilst the radiologist reported during clinical practice. An independent consultant radiologist then compared the reports from the radiographers and radiologists to that of the index radiologist for agreement. Following this an orthopaedic surgeon assessed whether the disagreement between the reports was clinically significant. The study results showed that the overall agreement between index radiologist and observers was comparable and within a range of (54% to 68%); for knee was 46 – 57% and for lumbar spine 56 – 66%. There was a small observed difference of 0.6% (95% CI 11.9 to 13.6) in mean agreement between the radiographers and radiologist. Radiographers' discordant reports were less likely to have a clinically significant effect on patient outcomes when compared with the radiologist discordant report for the knee and lumbar spine. Less than 10% of observers' reports were sufficiently discordant with the index radiologist reports to be clinically significant. The study therefore concluded that selected MR radiographers with postgraduate education reported in clinical practice conditions on MRI examinations of the knee and lumbar spine to a level of agreement comparable with non-musculoskeletal consultant radiologists.

Prime et al (1999) in a study of all six centres that offered courses in radiographer reporting at the time, examined the structures of the courses by analysing the course material from the schools. Two samples of course material were used to identify major themes. A 27-point questionnaire was developed and distributed to the 6 schools. The

results showed that the institutions placed emphasis on meeting the needs of clinical departments and their patients. There were variations in the course content, award and measurement of competence. The results also show it was not possible to compare the standards of outcomes of the courses although it is significant that the courses had similar assessment patterns. The study also recommends for those who want to embark on the development of a reporting course to explicitly link clinical and academic learning. The importance of the inter-relationship of the roles of the radiographer and the radiologist in reporting and finally the need for experimental learning was emphasised. Interestingly the method used in gathering the data was not very effective, in that the researchers did not request to see copies of the course material and structure. They relied on a condition imposed on respondents to answer questions only based on approved programme documents. It is possible this condition was not always followed.

#### 2.5.4 Scope of practice

The Society of Radiographers (SoR) conducted a study in 2012 to update the Scope of Radiographic Practice 2008 report. This was done by the use of an online questionnaire that was sent to imaging managers, superintendent radiographers and consultant radiographers throughout the UK. The study had a diagnostic radiography and a therapy component. In diagnostic radiography, the response rate to the study was 11% compared with the 67% response rate from therapy.

In diagnostic radiography, the study showed the scope of practice continues to expand as there is a significant increase in the number of departments undertaking radiographer-led examination in gastro-intestinal studies and interventional procedures. There was also an

increase in the number of radiographers issuing written reports, especially in ultrasound. There was also an increase in the number of departments offering musculoskeletal and nuchal thickness services, however, there was a decrease in the number of departments offering services for early pregnancy, obstetrics and abdominal ultrasound. This could be as a result of an increase in requests for musculoskeletal and nuchal thickness services. The study also recorded a three-fold increase in the number of research radiographers when compared to the 2008 study. This is particularly refreshing as the 2008 report identified it as an area that needed attention. The number of radiographers with roles in clinical education however dropped from 42% to 33% (SoR, 2012).

The study also found that the number of departments with a 'red dot' system had reduced significantly from 2008. This is likely to be as a result of the system being replaced with other image interpretation systems. Appendicular and axial skeleton and barium enema are the most common areas where radiographers produce written reports outside of ultrasound. In ultrasound about 90% of respondents have sonographers producing and verifying their own reports. There was also a decrease in the number of departments that had radiographers performing intravenous injection or cannulation since 2008, again radiographer-led intravenous urograms (IVUs) were halved from 2008. This reduction, however, could be as a result of a preference for CT urograms or ultrasound (SoR, 2012).

The study also indicated that almost half of responding departments had radiographer-led barium studies and nearly half also had radiographers undertaking CTC. A third of the responding departments had radiographer-led CT examinations and about 25% had radiographer-led MRI examinations (SoR, 2012).

The results from the therapeutic component are not directly comparable to that of the 2008 study as the questions asked in this study were different. There are, however, a few questions that were similar to those asked in 2008 and in those cases a comparison can be made. The results from the study show the scope of practice across the entire radiotherapy pathway continued to expand (SoR, 2012).

The study showed an increase in the implementation of career progression framework with an increase of 29% in the number of centres with advanced practitioners and a 7% increase for those with consultant practitioners from 2008. There was also a 12% increase in the percentage of therapeutic radiographers involved in the quality assurance accreditation system since 2008. Therapeutic radiographers were responsible for obtaining informed consent from 37% of centres. Attendance by radiotherapy at multi-disciplinary team meetings by therapy radiographers occurred in almost all centres (SoR, 2012).

As with the diagnostic component there was an increase in research radiographers from the 2008 study, there was however a reduction in the centres with therapeutic radiographers in clinical education from two thirds in 2008 to just over half in this study. There was an increase in the percentage of centres with therapeutic radiographers in information and support services from 2008. The study saw a decrease in therapeutic radiographers with a brachytherapy role from 61% in 2008 to 54% in 2012, an increase in the number of centres with a tumour site specialist radiographer from 27% in 2008 to 65% in this study. In all but one centre, pre-treatment imaging was undertaken by therapeutic radiographers and there was a decrease of 12% of the number of centres with therapeutic radiographer-led treatment planning services since 2008 (SoR, 2012).

Community liaison roles were available in just 5% of centres, whilst in 88% of centres, therapeutic radiographers were members of their network radiotherapy group. Radiographer-led treatment follow up for therapeutic radiographers was undertaken in 30% of the centres whilst toxicity monitoring and management of patients after completion of treatment for radiographers took place in 23% of the centres (SoR, 2012).

The study established that, in most cases, the scope of practice in both diagnostic and therapy radiography has increased over the years (SoR, 2012).

#### 2.5.5 Impact of role extension on patient outcomes and service quality

In a study to investigate the impact of role extension in radiography on patient outcomes and health service quality, Hardy et al (2016) performed a systematic review of the literature. Electronic database analysis and hand searching of the last year of key journals was undertaken and articles in press were also included. A reference list of included studies was also searched. Where the searches found theses or conference proceedings the authors were contacted.

The articles were found to be of low to moderate quality, some provided limited information on methodology to determine quality and some evaluated advanced practice in a single centre. Six studies considered cost reduction, three considered reduction in patient morbidity, two each for reduction in time to treatment and patient satisfaction.

This review found significant emphasis being placed on cost effectiveness and inter-professional comparisons which might be a sign of the professional priorities at the time when advanced roles were being introduced. It was also evident from the review that there was a possibility of significant cost reduction to the hospital as whole, through



service redesign, role substitution and pay differentials. It was therefore suggested that researchers seeking to evaluate the impact of role advancement should look beyond role comparison and cost efficiencies in order to determine the wider impact of role advancement. Patient morbidity was not found to increase with the introduction of radiographer reporting trauma musculoskeletal images, regardless of when the report was completed. Treatment was not affected either, although in one of the studies the introduction of immediate reporting by radiographers did reduce the number of false negative diagnoses and subsequent patient recalls. It can therefore be assumed that this could reduce patient morbidity as a result of an improved clinical diagnosis and treatment. The review concluded that whilst there is some evidence of the impact of advanced roles on patient outcome, the evidence on service quality is very limited. The evidence available mainly relates to positive contribution in terms of service efficiency, patient outcomes and acceptability. If advanced practice is to be further developed, more research is required on the service quality aspect.

Similarly, Snaith (2007) undertook a pilot study to evaluate the impact of a radiographer-led discharge at the accident and emergency department (A&E). Three experienced radiographers were trained to discharge patients with normal radiographs or refer for further management by following a documented plan by the clinician at A&E. Discharge included advice on exercise and management of soft tissue injury. The study was conducted over a period of four months. An immediate report was prepared for all patients attending within the period of the study. The study results showed 5% of the patients were discharged by the radiographer and a further 2% were directly referred for treatment. The number of recalls due to misinterpretation decreased by 52% when

compared with data from the three previous years. It was thus concluded that radiographers are capable of extending their roles outside the radiology department and making a contribution to patient management whilst decreasing the risk of misinterpretation at the A&E. The study was a pilot study in one hospital and a follow up multi-centre study would be more robust.

Hardy et al (2013) undertook a multi-centre randomised controlled trial, this study was conducted to ascertain whether radiographer-led immediate reporting for Emergency Department (ED) can provide a cost-effective service improvement solution. Patients were recruited and randomly allocated to immediate or delayed reporting arms and treated to group assignment. Patient health gain was measured at baseline and then followed up after 8 weeks. Resources used and the cost of the immediate reporting service were analysed at the patient level and compared to the standard reporting practices. The results from the study showed that there was a significant reduction in interpretive errors in the immediate reporting arm, there was no significant difference in the health status of the patients in the two arms and there was on average a cost saving of £23.40 per patient in the immediate reporting arm. The study concluded that radiographer-led reporting of ED radiographs is cost effective and its universal introduction could lead to greater reduction in cost without reducing the quality of care. It also results in reduced interpretive errors.

Additionally, radiographer reporting has been introduced generally as delayed reporting. Hardy et al (2008) conducted a study to compare delayed reporting and immediate reporting by the same radiographers in order to establish whether there were any significant differences in the diagnostic outcome. They recruited three experienced

radiographers who reported musculoskeletal trauma radiographs immediately over a period of three months. The cases were taken from all age groups. A random sample of these immediately reported radiographs were selected for delayed reporting. The two reports were independently compared by two experienced film readers. There was 91.3% concordance in diagnostic outcome. Statistical analysis indicated that the paediatric cases had higher odds of discordant reports. The study concluded that there was no significant difference demonstrated between the immediate and delayed reports issued in the trauma department. The study was a single site study that involved only three radiographers. A similar study with an increased number of radiographers at multiple sites would be desirable.

Furthermore, Snaith et al (2016) reviewed the contribution of advanced and consultant practitioner radiographers on service delivery whilst reporting on radiographs and the impact this has for both patients and staff within and without the imaging department. The study was a prospective exploratory study and made use of activity diaries where the participants entered their activities in 15 minute blocks. This was done over a period of one week. Thirteen radiographers reporting independently across 6 sites of a busy multisite trust. Radiographers reported on 79.6% of all examinations during the study period. The radiographers spent most of their time reporting, but 69.5% of the reporting time was interrupted. The radiographers reported an average of 19.3 reports per hour. Other tasks performed by the radiographers included administrative work, amendment to rotas, preparing presentations and documenting incidents identified whilst reporting. The study concludes that advanced and consultant radiographers support service delivery

beyond image interpretation. The study's strength lies in the fact that a high number of participants were involved and it was also a multi-site study.

#### 2.5.6 Narrative opinion papers

These papers have been selected for various reasons. Cowling (2008) was selected because it gives a global overview of the changing roles of radiographers and the various stages of development in countries across the globe with regard to role extension. The remaining papers address how to develop protocols when introducing advanced practice in radiography. No empirical papers have been found in that regard despite it being an important area.

Cowling (2008) gives a global overview of the changing boundaries of radiography and identifies the huge difference between countries such as the UK and the USA and others who are still fighting for recognition and regulation of the profession. For these countries Cowling contends that role extension is a remote possibility. The point is made that role extension across the world is driven by skills shortages, cost reduction, technological advancement, health sector reforms, quality improvement and new medical interventions. Cowling also contends that although the drivers for role extension are the same the world over, countries are at different stages in the process of implementing role extension. There are four levels in which each country can be placed with regards to the stage of development of radiography and by extension how far or close they are to role extension.

The first level comprises countries where there is a discourse between government and all the relevant stakeholders, backed with research and university graduate programmes

which have been placed at the forefront of professional needs, resulting in actions and implementation of role extension. The second stage is made up of countries with the same driving forces present but where implementation of role extension has not been significant. The third level is made up of countries where the profession is recognised and they are now moving to university level degree or equivalent as a requirement for entry level to practice. For the third level, role extension is the next potential step. The final level is those countries that have no formal recognition for the profession and also do not have national standards for radiography education.

#### 2.5.7 Protocols and guidelines for introduction of new roles

'Protocols' with respect to the healthcare community are used to refer to a set of 'best practice' guidelines for performing a particular procedure. In other words, a protocol is an agreed and documented system which outlines how certain categories of patients are to be managed and by whom (Nightingale 2008).

Nightingale (2008) suggests a list of items that are considered as vital ingredients of a good protocol, these are; background, education and training, scope of practice, procedure for performing or reporting examination, report structure, clinical audit, continuous professional development, verification section and references. These are outlined in Table 2.2 adopted from Nightingale (2008). Again, the point is made that, whilst protocols and procedures for individual examinations need to give the practitioner suitable guidance framework, there is a danger that some protocols may be overly restrictive. Such restrictive prescriptive protocols work against patient care rather than improving it (Crawley et al 1998) especially where a cautious approach is taken in introducing an advanced role for the first time.

Owen et al (2004) use a critical analysis approach to propose a method for developing and archiving a protocol. It provides issues for deciding what the scope and content of a protocol should be. Emphasis is placed on the importance of a protocol by insisting that *'if all professionals work to the same protocol then all patients can be assured of the same quality of services, reducing inter- and intra-operator variability'*.

Paterson et al (2004) in explaining the need for a protocol, insist there is no single model for radiographer reporting and the involvement of others. It should be done to suit the local needs of the health care services. The importance of strategic and effective planning is emphasized when Paterson et al (2004) writes;

*'Once the decision has been taken in principle to implement radiography reporting services it is imperative that planning is given the highest priority if problems and difficulties are to be avoided during implementation'*

They also contend that the planning process should embrace key phases that will ensure successful implementation. The phases are consultation, defining scope, resourcing, authorisation and implementation. There should be consultation with all stakeholders to ensure that everyone is involved in the decision-making process. The scope of what is going to be done should be clearly defined in order to prevent any ambiguity, resources should be provided and authorisation should be given prior to implementation.

Section of protocol	Description of contents
Title	Clearly identifies contents
Background section	Documents current service base to support the practice. Historical development of the role at the hospital. Explores local service need
Education and training	Minimum requirement (formal and in house education) to perform or report the examinations. Special requirements for those in training.
Scope of practice	Examinations and patient categories that can be managed by the radiographer. Degree of autonomy enabled by protocol
Procedures for performing or reporting examinations	Steps involved in performing or reporting the procedure. Minimum facilities required. Standards to which radiographers should conform. Contraindications and unusual /emergency scenarios when the normal protocol is not followed.
Report structure	Elements of the report including possible reporting codes used.
Continuing professional development	Minimum (and recommended) CPD expectations of radiographers to maintain and document their competence
Verification section	Approval of the protocol at all levels
References	Key references including peer reviewed and professional body or Department of Health literature

Table 2. 2 Ingredients of a protocol.

## 2.6 Further Evidence.

A further search of the literature was conducted towards the end of the study. The approach, as described earlier in the chapter, was maintained. The timeline was however limited to June 2017 when the initial search was conducted, to April 2019. In this search 23 papers were retrieved. Of this number 7 were found to be of importance to the study. However, 6 of the 7 of the papers were on areas that have already been reviewed, 1 paper provided some further insight on issues that had come up in the course of the study. One of the papers was on role extension in a hospital in Ghana.

Again, whilst education and training were emphasised, the need to develop a new curriculum for education and training of radiographers in order to meet the changing demands of the jobs was not discussed. Sloane and Miller (2017) in their study contend that due to significant changes in the way radiology services are delivered, mainly due to advances in technology and the huge increase in the number of requisitions, it is important to evaluate how newly qualified radiographers can meet the expectations of radiology managers in the UK. The study interviewed 20 radiology managers across the UK from a range of providers. They concluded that radiography as a profession is in flux and challenged various stakeholders to review and develop the curriculum and career structure to reflect the fast- paced technological changes in order to meet the demands of the time.



### 2.6.1 Accuracy of radiographer interpretation and does education impact on radiographer accuracy?

In a systematic review of image interpretation by radiographers in South Africa, van de Venter and ten Ham-Baloyi (2018) reviewed papers in the areas of accuracy of image interpretation of radiographers, experiences, the possible influence of training on accuracy of image interpretation and the potential impact of image interpretation by radiographers on patient outcomes in South Africa. The study concluded that training impacts on the accuracy of radiographers in image interpretation. They recommended that education and training was needed in order to equip radiographers in South Africa with the requisite knowledge and skills to proceed with image interpretation. They also recommended that education should be at the postgraduate level. They further recommended that the statutory bodies should widen the scope of practice undertaken by radiographers to include image interpretation. This would enable radiographers who have had the required education on image interpretation to legally perform that role. The review also argued that there was a need to ensure judicious use of resources in a country that had resource constraints. Using radiographers for image interpretation is cost effective and will improve the quality of care that patients receive. The review was however limited by the relatively few papers that met the inclusion criteria. It is also further limited by the fact that all the studies included in the review were conducted in only four out of the nine provinces of the country.

Additionally, Williams et al (2019) conducted a pilot study in Victoria, Australia to evaluate how effective two short courses would be on improving the accuracy of radiographer's interpretation of images of the appendicular skeleton. Eight radiographers volunteered

and were selected as participants of the study. The participant's knowledge of image interpretation was tested before the start of the training, post the first module of the training, pre the second module of training, post the second module of training and 6 months after the completion of the second module of training. Module 1 pre- scored 6 out of 8 of the participants below 80%, however all 8 participants achieved mean scores of 83.6% with scores ranging from 80.5% to 89.5%. The study also found that the sensitivity rate (95.2%) at the end of the training was higher than specificity rate (81.3%). The participants appeared more confident when identifying abnormal cases than normal cases. The study also indicated that participants appeared to lose some of the acquired knowledge after 6 months, which was mainly due to the fact that image interpretation was not part of their role in clinical practice. There is, therefore, a need to have continuous professional development and continuous use of acquired knowledge and skills in order to maintain and improve upon accuracy. The study is limited mainly due to the fact that all participants were from one site and there were few participants. A multi-centre study with more participants would be more likely to present reliable findings.

Similarly, Tay and Wright (2018), in a study to assess the effectiveness of an in-house training programme developed in a Singaporean hospital, used two groups of radiographers involved in general radiography within the hospital. The first group of 40 radiographers were the control group, this group continued with their regular clinical work whilst the second group of 8 radiographers participated in the hospital's in-house image interpretation programme. The two groups were assessed at the end of the training period and both groups returned to their regular clinical practice. However, the second group continued to receive support and guidance in image interpretation. Both groups

were assessed a year later. The initial test after training showed the second group that had received training scored a higher mean sensitivity of 83% compared to the 72% of the control group. However, the control group had a higher mean specificity of 68% to the 56% of the group that received training. Both groups however had very similar accuracy of 70% for the group with training and 71% for the control group. One year on, the group that received training showed a significant improvement in their mean accuracy to 86% against 70% from the control group. This increase was as a result of their mean specificity increasing from 56% to 87%. The study therefore concluded that with training and continuous mentorship and support, the in-house training programme is a cost-effective way to develop the skills of radiographers in image interpretation.

Piper et al (2018), analysed objective structured examination (OSE) results of the first cohort of radiographers of an accredited postgraduate programme in clinical reporting of neurological magnetic resonance imaging (MRI) examinations of the head and cervical spine. The answers provided by this cohort of radiographers were compared with the agreed answers that were arrived at by three consultant radiologists. The combined mean sensitivity was 98.86% and mean specificity was 88.37%. The study therefore concluded that this cohort of radiographers, following an accredited postgraduate programme, are capable of interpreting cervical and head MRI examinations to the same standards as consultant radiologists. The study is limited due to the fact that it was done in academic conditions and that might not be the same as clinical conditions. It is therefore recommended that a similar study be done under clinical conditions.

Moreover, Woznitza et al (2018), conducted a study aimed at determining the accuracy of reporting radiographers' interpretation of chest radiographs. The study involved ten

consultant radiologists and eleven reporting radiographers. The test bank used was made up of 106 chest radiographs of various pathologies. Half of the radiographs were normal and the other half had pathologies. Each participant interpreted the images and their reports were compared to that of the gold standard, being two thoracic consultant radiologists. The Jack-knife alternative free-response receiver operating characteristics (JAFROC V4.2) was used to determine performance of observers. The study also used a non-inferiority approach with a predetermined margin of clinical insignificance of 10% of consultant radiologists' diagnostic accuracy. The study concluded that with the right postgraduate education reporting, radiographers interpreted chest radiographs at accuracy rates comparable to that of consultant radiologists. The number of test bank cases used was high and so was the number of participants from each profession. The study was very robust and produced findings similar to other such studies in the literature.

Ofori-Manteaw and Dzidzornu (2019) in a study that assessed the accuracy of image interpretation of the appendicular skeleton by junior doctors and radiographers, in a hospital in the western region of Ghana, determined that education and training improved the accuracy of both junior doctors and radiographers. The study involved eight (8) radiographers and twelve (12) junior doctors at the same hospital. The accuracy, sensitivity and specificity of both groups was determined by interpreting the same set of images before and after training. The scores for radiographers before training was 68.8% accuracy, 69.2% sensitivity and 68.3% specificity and after the training the scores increased significantly to 83.3% for accuracy, sensitivity and specificity. The scores for the junior doctors before training were 71.6%, 67.8% and 75.6% for accuracy, sensitivity and specificity respectively. The scores increased significantly after training to 81.9%, 77.2%

and 86.7% for accuracy, sensitivity and specificity respectively. The accuracy of interpretation between the radiographers and junior doctors is not statistically significant. The study also found that education improved the accuracy of interpretation of radiographs by both junior doctors and radiographers and therefore indicated that radiographers would need postgraduate education to accurately interpret radiographs. It also concluded that doctors were not adequately trained to interpret radiographs. The study is a single site study that involved only eight (8) radiographers and twelve (12) junior doctors, a similar study conducted across the country involving multiple sites and more participants would be deemed as a more robust study.

## 2.7 Summary and conclusion

This chapter is in two sections, the historical perspective and the empirical review section. The historical perspective section traced the journey of radiography from the time when X-rays were invented up to the late 1990s. Initially there was no distinction amongst those practising radiography but then medical doctors created a distinction between themselves and everyone else practising radiography. They called themselves medical radiographers and everyone else was referred to as lay radiographers. They sought to prevent lay radiographers from practising radiography altogether but this was abandoned when they realised that many lay radiographers could take the plates (images), especially after the army trained many personnel who had qualified to practice after the First World War. They further changed their title to radiologist and the lay radiographers were called radiographers. A distinction had well and truly been made. A professional boundary was created and this stopped radiographers from interpreting images. This continued for decades.

However, an increasing workload coupled with a shortage of radiologists, advancement in technology, complex and time-consuming procedures, change in government policy and radiographers' desire to extend their practice, resulted in the introduction of role extension in radiography. Firstly, as a radiographer abnormality detection system, also known as the red dot system, and later as radiographer commenting. Its introduction was resisted by radiologists but the above-mentioned factors and inter-professional collaboration has sustained it so far.

The second section reviews the contemporary literature available on role extension globally but with African and Ghanaian parallels. This section identifies the factors that acted as drivers for the introduction and implementation of role extension. The ability of radiographers to perform the same task to the level of the radiologists and whether education had impacted on their performance. Literature established that radiographers who had undertaken education can perform these tasks to the same standard as the radiologists. The literature reviewed the performance of radiographers in red dotting, plain film reporting, mammography screen reading, CT reporting and MRI reporting. The level of accuracy in all areas was comparable with that of the radiologists. Education significantly improved the performance of radiographers thereby raising a need for postgraduate education to enable role extension. The scope of practice was explored to determine the new scope of practice following the introduction of role extension over the years. The literature reviewed indicated that the scope of practice for both diagnostic and therapeutic radiography has been expanding over the years since the introduction of role extension. When introducing new roles it is necessary to develop protocols and guidelines

for those new roles, so the literature was reviewed to determine ways in which protocols and guidelines could be developed to enable successful implementation of role extension.

The drivers that have led to the introduction and implementation of role extension globally have been the same. Cowling (2008), contends that although there is commonality in the practice of radiography the world over, there are varying factors at play with regards to role extension in different countries. She argued that there are four levels at which each country can be placed with regards to the stage of development of radiography and by extension how far or close the country is to achieving role extension.

The first level comprises countries where there is a discourse between government and all the relevant stake holders, backed with research and university graduate programmes which have been placed at the forefront of professional needs, resulting in actions and implementation of role extension. The second stage is made up of countries with the same driving forces present but where implementation of role extension has not been significant. The third level is made up of countries where the profession is recognised, but they are now moving to university level degree or something of equivalent value as requirement for entry level to practice. For those, role extension is the next potential step. The last level is comprised of those countries that do not have formal recognition for the profession and do not have national standards for radiography education. Ghana, from the foregoing, can be said to be in the second category of countries. The profession is recognised, has university level qualification as entry level requirement for state registration, has a regulatory body but with no significant implementation of role development although importantly, all the drivers for role extension are present. The logical next step will be role extension.

Again, possibly Ghana is in a worse situation today than the UK was at the time when it introduced role extension. Ghana has thirty-five radiologists and ten administrative regions. The national shortage of radiologists is exacerbated by their uneven distribution (Royal College of Radiologists, 2017). For example, Northern region accounts for 30% of the total land mass and 10% of the national population, (Government of Ghana. Northern, 2017) but currently has only two visiting radiologists (Royal College of Radiologists, 2017). Most radiologists are located in the southern capital Accra and in the second city of Kumasi. The skewed distribution of radiologists is compounded for service users by the fact that those regions ill-served by radiologists also have the lowest doctor-to-patient ratios. For example, the doctor-to-population ratio in greater Accra region in 2015 was 1:7,196, whilst the figure for Upper East region was 1: 30,601 (National Development Planning Commission, 2016).

Additionally, even within the two big cities, most radiologists are involved in complex time-consuming procedures which take most of their time. They therefore have very little time for their other duties, this leads to long report turnaround times which affects the patients because the medical officers might have to attend to them without a radiologist report. An urgent solution is required in order to address these challenges.

In most of the developed world the solution to these challenges has been through role extension in radiography. However due to differences in the healthcare structure, both traditional and economic, adoption of solutions that were used in similar situations in other countries might not work for the local Ghanaian situation. Most of the articles reviewed for this study were not from Africa, sadly, there were no articles from Ghana.



Given that Ghana is faced with a dire shortage of radiologists, coupled with a skewed distribution of the radiologists they do have, the present study in the Ghanaian context needs to involve all the key stakeholders in radiography to explore role extension opportunities and its possible impact on patient care.

## Chapter Three

### Methodology

#### 3.1 Introduction

The chapter covers the methodology thus: philosophical standpoints, these include the epistemological and ontological assumptions on which the study is based.

#### 3.2 Philosophical framework

The design of this research is heavily dependent upon the fundamental assumptions made about the nature of reality (ontology) and how to gain knowledge about it (epistemology). Ontology is *“the study of being”* (Crotty, 1998:10) or *“the nature of reality”* (Lincoln and Guba, 1985:37) whilst epistemology is *‘how we know what we know’* (Crotty, 1998:8) or *“the nature of the relationship between the knower or would-be knower and what can be known”* (Guba et al., 1998:201). It is the relationship between the researcher and what is deemed the reality (Carson et al., 2001) or how this reality is known. The research philosophy is important to the research exercise as, if the appropriate questions are not asked about the reality that the research is attempting to explore, explain or describe, it is most likely our knowledge of that reality or phenomenon will be shallow and poor. This could lead to research that is not adequately justified or lacks wider credibility and internal coherence (Clark et al., 2008).

Positivism is defined by the belief that reality is external and can only be known through empirical observations. Law-like generalisations exist (even) in social settings that makes it possible to formulate predictions and explanations. This regularity is what leads to positivists having the belief that they can make causal statements, thus if two events occur

in a particular sequence then one is said to explain the other (Easton, 2010). Positivism is often, but not always, associated with quantitative research methods that involve measures of quantity, frequency or intensity of occurrence (Denzin and Lincoln 1994). The most common or popular method used in the quantitative approach is the survey method. The aim of quantitative research is usually to gather data so that the results from the research can be generalised beyond the participants, bias can be minimised and the internal validity of the research can be increased by introducing a control (Polit and Hungler, 1999). Constructivism on the other hand is often associated with the qualitative tradition. Constructivists are of the belief that 'reality is socially constructed' (Mertens, 2005): reality is thus subjective and experienced, cannot be empirically observed and can only be known through the individual's interpretation of it. Constructivists tend to use interpretive methods, (even though other ontological positions could support the use of interpretive methods) in exploring social constructions. This paradigm is often concerned with the 'what' and 'how' questions (Silverman, 2013).

Positivists and constructionists are often seen as being mutually exclusive or diametrically opposed, however moves towards conceptualising a spectrum of paradigms and the use of a mixed methods design are apparent (Creswell, 2012). Critical realism emerged during the battle for supremacy between positivist and constructivist research paradigms in the 1980s (Denzin & Lincoln, 2011). Critical realism combines both paradigms to give a comprehensive report of ontology and epistemology. Critical realists operate with the assumption that reality indeed does exist, but it is independent of our knowledge of its existence and can only be partially observed. The critical realist also believes that there are three levels of reality, the 'empirical which can be observed or experienced, below

this empirical level is the 'actual' level which may or may not be observable but regulates the empirical and finally, there is what is called the 'real' which underpins the 'actual' (Bhasker, 1975). This is illustrated in Figure 3.1 page 82. The critical realist belief is that there are 'generative mechanisms' that aid in our understanding of the 'actual' but are not fully explanatory, rather they are 'tendencies' or causative agents. Partington (2000) argues that in this reality that is multifaceted, some parts of the phenomena are directly observable whilst others can only be known through accounts of social actors and by 'researcher speculation over apparent casual tendencies requiring further enquiry and verification' (Partington, 2000:98).

Creswell (2012) argues that social interaction, historical and cultural influences in an individual's life play a key role in how they arrive at the subjective meaning of a phenomenon and that it is not just based on the individual's views. Snape and Spencer (2003) contend that aspects of reality can only be explored through socially constructed meanings which support the critical realist ontological basis. This ontological basis makes it possible for an epistemological approach that allows for both direct and indirect observations. Again critical realism makes space for attention to be paid to social structures whilst not neglecting the individuals (Porter and Ryan, 1996).

The critical realist approach allows for attention to be paid to both social structures and individuals and thus fits in well with the aims of this research, for this reason it was the chosen approach for the study. This study explored a relatively poorly explored research area in Ghana, therefore qualitative data collection methods which explore issues, reveal experiences and also legitimise different 'voices' as a part of the reality (Richardson, 1994), were deemed to be appropriate for the study aims. The role of the researcher,

therefore, is to establish an interactive link with the participants, to gain an understanding of role extension opportunities in diagnostic radiography in Ghana from their socially-constructed reality. The study explores ways in which role extension opportunities in radiography impact on the quality of care that patients receive. The results of this study are therefore a product of an attempt to understand role extension opportunities in diagnostic radiography in Ghana and their possible impact on patient care from the perspectives of the participants who have experienced the situation in various ways.

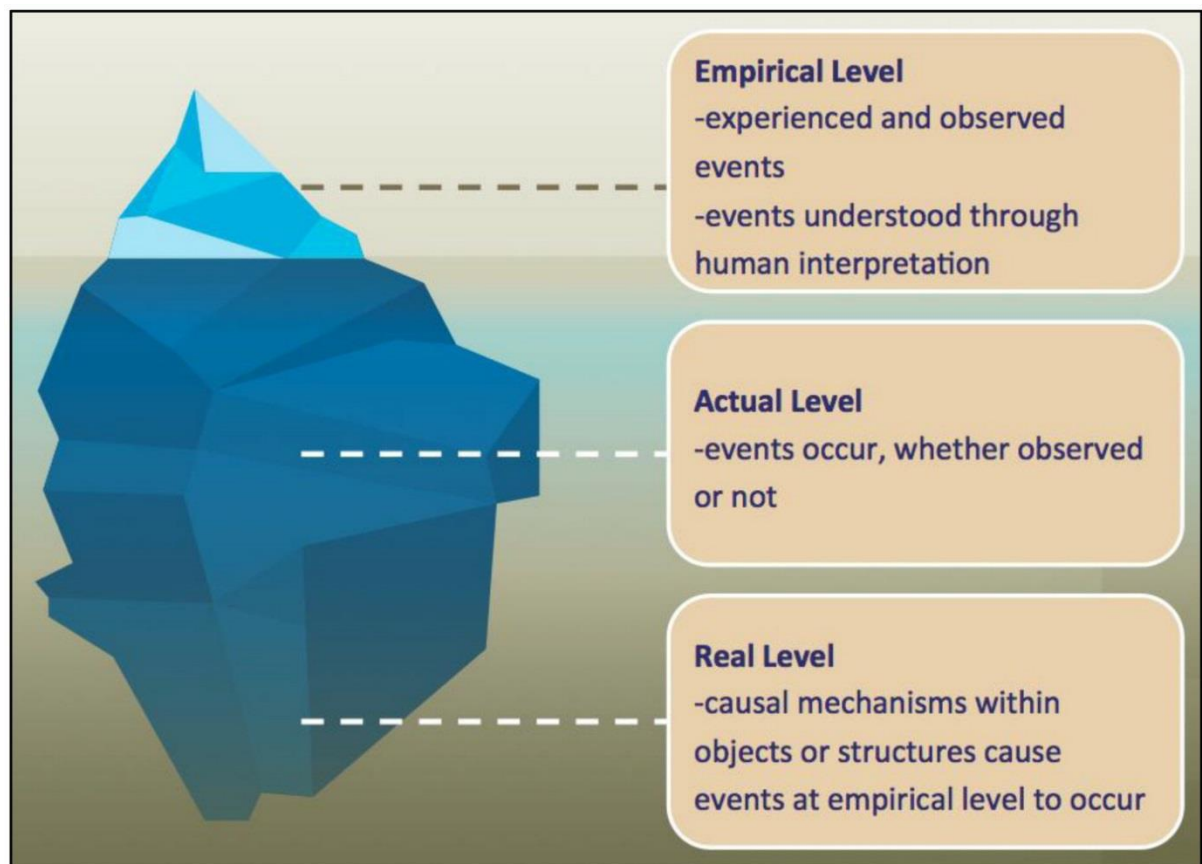


Figure 3. 1 an iceberg metaphor for critical realist ontology. Adopted from Amber J. Fletcher (2017)

### 3.3 Methodologies

This study explored the experiences of radiographers, radiologists, medical officers, higher education institutions, policy makers and regulatory bodies about role extension opportunities within diagnostic radiography in Ghana. It also explored the need for role extension in Ghana, the possible barriers or challenges to its implementation and how, from their experience, role extension might impact on the quality of care that patients receive. In order to gain an understanding of the issues that this study sought to explore, it was essential to gain an understanding of the participants' experiences as they construct it in their own context.

Two main methodologies are associated with the positivist and constructivist paradigms to research. These are the quantitative and qualitative designs. Quantitative research tends to be more associated with the positivist paradigm whilst qualitative is mostly aligned to the constructivist paradigm. Quantitative design is based on numbers and values and these numerical values are measured by using a known predetermined method. It normally has a large sample size from which the data is gathered, and numerical data can be analysed with statistics. It is mostly objective in nature and seeks to generalise its findings to a group beyond the participants (Polit and Beck, 2008).

Qualitative design is mostly centred on the lived or reported experiences of participants and these are explored by interaction with the researcher. Data are usually collected by interviewing the informants, and the data generated from these interviews forms a rich narrative. The narrative usually constitutes a rich in-depth descriptive account of experiences which then allows the researcher to obtain detailed data. The narratives are analysed and themes are formed from the analysis, findings can then be drawn from these

analyses. Findings from qualitative studies are generally not widely generalisable due to the rather small sample size used and the fact that it places emphasis on the individual's experiences. Qualitative approaches are often chosen when little is known about a topic, further research using other methods can then be undertaken (Silverman, 2001). This study used a qualitative approach to allow the experiences of the participants to be explored in an in-depth manner. A qualitative approach also allows for lived experiences of participants to be explored, as this study sought to explore the experiences of participants a qualitative approach was deemed to be the best fit.

### 3.3.1 Case studies

Case study research is commonly applied in various disciplines (e.g., healthcare, psychology, sociology, political sciences and many others). Yin (2017) defines case study research as

*'An empirical method that investigates a contemporary phenomenon (the 'case') in depth and within its real-world context, especially when the boundaries between the phenomenon and the context may not be clearly evident.*

*A case study copes with the technically distinctive situation in which there will be many more variables of interest than data points and as one result, benefits from the prior development of theoretical propositions to guide design, data collection, and analysis, and as another result, relies on multiple sources of evidence, with data needing to converge in a triangulating fashion.'* (pg. 15)

According to Yin (2003) the case study approach enables the provision of in-depth and detailed study of a phenomenon within a context and provides an empirical mode of

enquiry. Taylor (2013) argues that the case study approach can be used to explore multiple sources of data, within a real life setting. Yin (2017) agrees by indicating that case study research relies on 'multiple sources of evidence' which can include interviews, observations and documentary analysis. Data from these sources can be used to explore or explain the case or cases under study. Crowe et al (2011) adds that the case study approach can be used to explore service development or more generally to explore a contemporary phenomenon in the real life context.

The case study approach enables the researcher to explore the phenomenon in its natural setting and also provides the latitude to collect data from multiple sources in order to answer the 'how' and 'why' questions. Case study seeks to understand the boundaries of the case and the complex patterns within its bounded system (Stake 1995).

Case studies have been classified in many different ways; Hakim (1992) classifies case studies into three types: descriptive, experimental and selective. Burns (2000) gives six classifications: historical case studies, oral history, situational analysis, multi-case studies, observation and clinical case studies. In contrast, Yin (2009) argues that case studies can be classified into three groups: descriptive, explanatory and exploratory. Yin (2003) describes explanatory case study as explaining causal links in real life conditions, exploratory case study as exploring a situation in real life that has no single outcome and descriptive case study as describing a phenomenon in real life context. This reinforces the fact that case studies can be classified in many and varied ways. This study uses the Yin approach because it is exploring role extension opportunities in diagnostic radiography in Ghana, which is a real life situation and as such it can best be described as an exploratory case study. Moreover, Yin (2017) argues that in general "what" questions can either be



exploratory in nature or about prevalence which will require the review of archival records. This study is not about prevalence and as such can best be described as an exploratory case study.

Case studies can be comprised of either single or multiple cases (Stake, 2006), however some fields such as political science and public administration have sought to distinguish between the two types and have used terms like comparative case study in an attempt to present it as a distinctive form of multiple-case study. In reality however single and multiple-case studies are simply variations of the case study design (Yin, 2017). This study is a single case with multiple sites.

Yin (2017) describes three conditions that should be considered if one intends to do case study research. These conditions are; the form of research question posed, the control a researcher has over actual events and whether the phenomenon under consideration is contemporary or historical. The research question is normally categorised as “who,” “what,” “why,” “where,” and “how” questions. Generally, research questions that focus on the “what” are of two types. The ones that are exploratory in nature, for example “what can be learnt from a start-up business”, can be an exploratory case study, by testing the possible differences in start-up business by first timers and start up business by seasoned entrepreneurs. An exploratory survey that explores the possibility of testing start-up business, or an exploratory experiment in which various incentives are tested to determine which one of the incentives will be ideal for a start-up business. Then there are the ones that are in the “to what extent” line of questioning. For instance a question like “What extent has Wales assimilated new immigrants?” is more likely to be explored by using a survey. A case study in this instance will not be very useful.

Also, case studies require that the researcher should not have control over the actual or behavioural events in the study. It was therefore important that I did not have personal control over the actual or behavioural events. Furthermore, the phenomenon under study is contemporary and not historical. I am therefore satisfied that this study meets the three conditions set by Yin (2017) for case studies.

Crowe et al (2011) contend that in the case study approach, the case should be defined, case selected, data then collected and analysed and the findings reported. However, Yin (2003) on the other hand considers that there are three stages in case study design, defining the case, selecting the case study design and being guided by theory in the design. Yin (2003) further contends that because the case study approach allows for gathering of data from multiple sources such as interviews, observations and documents, it is important to triangulate data from the various sources to show how robust the study is. He also explains that a protocol is needed to guide the study and to explore rival explanations for issues (Yin 2003).

Whilst Yin (2003) argues that a case study protocol is not a must, he contends that it is good to have a 'mental framework' of questions for the research to ensure the researcher remains focused throughout the study. He maintains that the researcher should keep an open mind and explore possible rival explanations and use various scenarios as if a crime scene detective trying to unravel a crime. This can be seen as being sceptical and not ruling out alternative explanations but investigating them and increased the reliability and transparency of the study.

This study is focused on healthcare professionals and how they go about their work in the midst of challenges and whether / how they are able to surmount those challenges. The

study also explored whether there are role extension opportunities resulting from their practice. The study therefore required the use of an approach that could generate an in-depth understanding of an issue in its real context to be able to answer the research question. Most qualitative methods even though they allow the researcher to explore real and actual levels of reality, they tend to concentrate on human agency data because their ontology is mostly constructivist. However, the framework of this study required a qualitative method that could capture both agency and structural factors. Agency factors are mainly focused on human subjectivity, mostly at an individual level and in a specific context. It encompasses exploring experiences of a person in the real world and social activity plays a major role in determining the productive capacity of an individual (Giddens, 1994). Layder (1997) contends that an approach relying on only agency factors has a high possibility of decreasing the impact of social life on a person's experience to the barest minimum, resulting in idiosyncratic theories being developed (Eisenhardt, 1989). Structural factors on the other hand use a wide range of research techniques mainly focusing on power, symbolism, language, communication and myths (Schwandt, 1997). Lincoln and Guba (1985) suggest that relying on structural factors alone leads to neglect of local experience and factors. However, Layder (1994:5) argues that a combination of agency and structural factors connect 'human activity and its social context'. Ethnography is one such method that gathers both structural and agency data (Porter and Ryan, 1996) and case study can also be used by a critical realist for the same purpose.

Angrosino (2007) describes ethnography as a method used by researchers to search for patterns that are predictable in the everyday human experience. This is done by the

researcher immersing themselves into the day-to-day routine or culture of the people being studied. The research process is inductive. He argues that the distinctive characteristics of ethnography include it being conducted in the natural setting of the participants, it is personalised as the researcher becomes a part of the group and as such is both an observer and a participant. Lastly, it uses multiple sources of data that are triangulated over an extended period of time. The ethnography researcher usually adopts an exploratory approach and remains flexible to data that emerges (Holloway, 2005). Ethnography was not used because of challenges envisaged with respect to the time intensiveness required to complete and the appropriateness for this particular study. Ethnography requires the researcher to be an insider in conducting the research from within. I sought to understand role extension opportunities in radiography from the perspective of the participants and did not think ethnography was the most pragmatic method to use in this study.

Grounded theory is a structured yet flexible research method. It is often used when little is known about a phenomenon with the primary aim of generating a theory that seeks to explain it. A distinctive feature of grounded theory is that it generates theory from the data (Glaser and Strauss, 1967; Birks and Mills, 2015; Bryant and Charmaz, 2007). An iterative research design, theoretical sampling and analysis are key features of grounded theory (Kennedy and Lingard, 2006). Data collection and analysis is often simultaneous and the analysis guides the next cycle of data collection (Kennedy and Lingard, 2006). Grounded theory, like case study and ethnography, uses multiple sources of data collections (interviews, observations and documentary review). Strauss and Corbin (1998) argue that it is important to start a grounded exploration with very little previous

knowledge and to collect data until there is saturation. They contend that having prior knowledge of the area under study will make the use of grounded theory very difficult. I already had considerable knowledge of the phenomena under study and had read a significant amount of literature on the phenomenon. It was therefore not pragmatic to use a grounded theory approach. This study did not also seek to generate a theory from data, as such grounded theory was not the method of choice.

Whilst it is true that both ethnography and case study methodologies can be used by critical realists to collect data from both structural and agency factors, Stake (1995) argues that case study is always defined by a specific focus of interest where the research is bounded by the focus and is explored through multiple perspectives, which is done within its natural setting. Ethnography on the other hand is focused on tacit knowledge of the culture of the participants and not a particular phenomenon. There are significant overlaps between the two methodologies and both are dependent on the epistemological assumptions made by the researcher. Even though the study explored role extension opportunities in radiography in Ghana and was done in the natural context of the participants and their way of doing things might have been affected by their society and culture, the study is focused on a bounded and specific phenomenon of role extension opportunities in diagnostic radiography and how it impacts on patients in Ghana. It therefore required a detailed exploration of specific bounded phenomenon of role extension opportunities, case study design was thus chosen as the most pragmatic for the study.

## Chapter Four

### Methods Chapter

#### 4.1 Introduction

The chapter explains how the previous methodological considerations, philosophical, epistemological and ontological, resulted in the selection of a case study design and outlines its accompanying methods to implement that design. It also explains the way in which the case study approach was used in this study, discusses the sample selection procedure and includes the method used for selecting the study sites. The materials and development of the instrument for data collection is followed by the process of analysing the data collected, describing how the credibility of the study was enhanced and the ethical considerations and various safeguards applied. Finally, reflections on my role as the researcher are captured. All decisions were taken with the central aim of answering the research question.

#### 4.2 How a Case Study Approach was used in this study

It is important to use what has been learnt about the case study approach to design the methodological framework of this study and to show why this approach was the best fit for the study. As indicated above by Yin (2003) it is important to first of all **define the case, select the case study design and the data sources**. The study involved healthcare professionals mainly, radiographers, radiologists, medical officers, a senior official from the Allied Health Professions Council (AHPC) and a representative from the Ministry of Health (MoH) (policy makers). The **case** of this study was the **shortage of radiologists** resulting in unreported radiographs.

It was important to include all the named professional groups (key stakeholders) to ensure that all the perspectives of the case under study are explored. It also served as a means of getting data from varied sources to help with triangulation which enhances the robustness of the study.

Case studies can be conducted using either single or multiple cases and each can have embedded units. The difference between the two is whilst a single case study with embedded units allows the researcher to explore one extreme case, multiple case studies with embedded units allow the researcher to explore several cases in order to understand the similarities and or the differences between the cases (Baxter and Jack, 2008).

This study explored a single case (radiologist shortage) by exploring the individual real life experiences of radiographers (both in clinical practice and academia), radiologists (both in clinical practice and involved in radiographer education), medical officers, regulators (AHPC) and policy makers (MoH). The study is a single case study with multiple sites. The boundaries of the case are the named professions, described above, within the three sites (Accra, Tamale and Wa) of the study. The sources of data are semi-structured interviews with participants, direct observations of participants, consideration of available government documents with relevance to the study objectives and the researcher's reflective diary. These four sources of data were triangulated, thereby increasing the robustness of the study as indicated by Yin (2003).

The research is an exploratory case study, with the objective being to explore and provide insight into the '**case**' (shortage of radiologists). The case study approach allowed for multiple perspectives of the case to be explored in order to gain an understanding of the phenomenon. This not only provided an avenue to conduct in-depth interviews with the

participants but also to 'shadow' them by observing them going about their normal duties. Observations were especially helpful because there is a blurring of boundaries in practice, it was unclear where the scope of practice of radiographers ended and that of the radiologists or medical officers began with regard to image interpretation. The interviews with the participants, radiographers (both in clinical practice and in training of radiographers), radiologists (both in clinical practice and training of radiographers), medical officers, policy makers and the regulatory authority of radiographic practice in Ghana) yielded very interesting results from a number of perspectives that sought to answer the research questions.

Yin (2003) advocates that there should be propositions (study objectives) at the start of the study that will act as a blueprint to ensure focus. Baxter and Jack (2008) also argue that having propositions at the start of the study helps to ensure that the scope of the study is limited and focused. The propositions of this study, as outlined in this chapter, are the study objectives and research questions. The study was therefore guided by the research objectives and every single step was guided by the objectives in order to answer the research questions. However, without these study objectives, the issue of role extension in diagnostic radiography generally would have been too wide a scope to explore within the timeline of this study. The study objectives thus ensured the study remained focused.

The study employed the use of four data collection methods, in depth interviews were conducted involving the key stakeholders in order to gain an understanding of their views on role extension opportunities in diagnostic radiography in Ghana, direct observations were carried out to understand how the various stakeholders currently go about their



duties within the context of possible role extension opportunities and documents were gathered and analysed to enrich the data collected by other methods. A reflective diary was also maintained and this was used as a further source of data. These are explained later in the chapter.

By interviewing members of the professions listed earlier in the chapter, various perspectives of the **case** became apparent from the various professional groups and also from the regulators and policy makers. The perspectives of higher education were also adequately presented. This ensured that most, if not all, possible perspectives were captured in these data. The data from the various sources were triangulated to increase the robustness of the study and to answer the research question.

### 4.3 Sample Selection Procedure

#### 4.3.1 Research setting

The research was conducted in Ghana, West Africa. The interviews and observations were conducted at three sites, Wa, Tamale and Accra. The selection of these towns was to include urban and rural communities. This also covered the geographic north of the country which is the poorer and least developed part and as such attracts fewer professionals and the geographic south, which is much richer and relatively better developed, has better living conditions and is therefore generally more attractive to professionals. Wa does not have any radiologists and Tamale has only one radiologist, both are located in the north of the country. Accra has over 65% of Ghana's radiologists and is in the south of the country. The interviews were conducted at the participants' work location except in one instance where it was done via skype. The reason for this was

to ensure that the participants were comfortable and that they did not have to spend time travelling for the interviews.

#### 4.3.2 Research Question

This study sought to answer the following questions:

How can the shortage of radiology workforce (radiologists' shortage) be resolved in Ghana? Are there opportunities for role extension in diagnostic radiography in Ghana and if so how can these opportunities be harnessed in a way that has an impact on the quality of radiological services and patient outcomes?

#### 4.3.3 Study Aim

To use a case study approach to investigate whether there are role extension opportunities in diagnostic radiography in Ghana and to explore their potential impact on the delivery of a quality service to patients.

#### 4.3.4 Objectives

To achieve the aim of the study, the objectives were;

1. Review the current evidence of a radiologist shortage in Ghana;
2. Evaluate options for addressing shortages of radiologists in Ghana;
3. Identify opportunities for role extension in radiography in Ghana;
4. Determine how role extension might be implemented in Ghana successfully;
5. Identify factors that might facilitate or inhibit its implementation

#### 4.3.5 Sampling strategy

Making sure that the sample selected is the most appropriate for a study is vital in establishing how robust a study will be (Harmmersley and Mairs, 2004). The study sought to produce a sample rich in information (Patton, 2002), as such only people who could enrich the study were invited. The informants had a rich knowledge of the phenomenon under study and were likely to provide an understanding of it (Cohen et al., 2002).

In a case study 'the case' (The shortage of radiologists) is of paramount importance, therefore a purposive sampling method was used. Case studies require an information rich sample (Patton, 2002), according to Etikan et al., (2016) this method is suitable when there is a need for participants to possess certain key characteristics that are critical to the research so that they can provide the required information.

Silverman (2001) contends that purposive sampling is not as simple a procedure as it may seem. This is because the researcher must firstly consider factors which define the group being studied, the next step is to draw up a list of criteria for the selection of participants. It was decided earlier in this study to ensure that there was maximum variation in the selection of participants, hence the selection of the various sites and participants was guided by this. A predetermined quota system for the various professions listed earlier in the chapter was then determined. This was done to ensure that experts in various professions had their perspectives on the case explored. The quotas assigned to radiologists and radiographers were determined based on the population of the two professions. It was also decided that one medical officer at each of the sites of study was adequate based on the information that was required from them.

#### 4.3.6 Recruitment

The participants were comprised of radiographers, radiologists and medical officers in clinical practice, this ensured that there was maximum variation in the perspectives in the various professions (key stakeholders) included on the case. One of the three radiologists who took part in the study worked in Tamale where he was the only radiologist available at the time of the study, the second radiologist practised in Accra where most Ghanaian radiologists are based and the final radiologist, who was also based in Accra, was involved in both clinical practice and the education of radiographers. The radiographers were also selected from Accra, Tamale and Wa, this was done in order to cover the sites where most radiologists work; those with just a single radiologist and a site with no radiologists at all. The same was done for the medical officers. Two radiographers, who were involved in the training of radiographers at the University of Ghana, also took part in the study. They were included in order to ensure that there was maximum variation and also to provide expert knowledge on issues with the education of radiographers in Ghana. The perspective of higher education was crucial because education and training will be required if role extension is to be implemented in Ghana, as such it was important to get their perspective. The study also included a policy maker from MoH and a representative from the AHPC. The selection ensured that there were various perspectives from radiographers at stations with radiologists and those without radiologists. The radiologists also gave their perspectives. The institutions of higher education brought a perspective of curriculum development and the education and training that may be required for the introduction of role extension. Whilst AHPC and the MoH also raised regulatory and policy issues respectively.

Following the granting of ethical approval from the School of Healthcare Sciences (HCARE) of Cardiff University (Appendix A) and The Ghana Society of Radiographers (GSR) (Appendix B), I applied for a list of all radiographers and medical officers practicing in Accra, Tamale and Wa. The GSR in their letter granting approval for the study, attached an introductory letter to their members requesting that they provide any support that I might need. They were however not obliged to take part in the study. Based on the list, the senior radiographers and medical officers were invited to take part in the study. These lists were obtained from the GSR and the Ghana Medical Association (GMA). The radiologists were contacted by the researcher with an invitation to take part in the study. The radiologists contacted were chosen on the basis of whether they practiced in any of the sites of the study, were involved in clinical practice or worked in higher education. There was therefore no need for a list from the Ghana Society of Radiologists. Tamale had only one radiologist, so he was invited to take part in the study. In Accra, consultant radiologists were invited to take part in the study and senior medical officers practicing in the study area were also invited to participate. Participants were selected from a list supplied by their professional associations except for the radiologists. This was done to ensure the sample was as varied as possible as this is an important consideration in case studies (Miles et al., 1994).

The study approached eighteen radiographers, six radiologists, six medical officers, one policy maker at the Ministry of Health and one senior official from the AHPC, however eight radiographers, three radiologists, three medical officers, a policy maker from the MoH and a senior official from the AHPC accepted and took part in the study.

The participants were each given a participant information sheet (Appendix C) in English which is the official language of Ghana. The information sheet explained the purpose of the study, the right to withdraw at any point even after consent had been given and without having to provide a reason. Their rights were explained and also what they would need to do if they consented to take part in the study. They had two weeks to consider whether they wanted to be part of the study. Those who consented were then contacted by telephone for further discussion and to answer any questions they might have. A suitable date and time for interview was agreed. All the face to face interviews were held in the offices of the participants. All participants signed a formal consent form (Appendix D) and granted verbal consent and this was captured on audio tapes before the start of each interview.

#### 4.3.7 Accra

Accra is the capital city of Ghana and as such has the largest concentration of all professionals, radiologists, radiographers and medical officers not excluded. It also houses all the policy makers, especially in the healthcare sector.

In Accra the study recruited two radiographers in clinical practice, two radiographers in higher education, one consultant radiologist in clinical practice, one consultant radiologist involved in the education of radiographers and a medical officer stationed at accident and emergency. A senior official from the MoH and a senior official from the AHPC were also participants in the study. The radiographers were selected based on seniority, availability and their ability to provide information rich data for the study. The consultant radiologists were selected based on availability and willingness to take part in the study. The medical officers at accident and emergency were selected based on availability and their

willingness to take part in the study. Doctors stationed at accident and emergency were chosen because they encounter more radiographs than all the other departments. They can be a source of very rich data.

#### 4.3.8 Tamale

Tamale is the capital of the Northern Region of Ghana, which is the largest region by landmass. The north of Ghana is generally poorer and more deprived than the southern part of the country and as such attracts fewer professionals, this is also the case for radiographers, radiologists and medical officers. In Tamale the study included two radiographers, one radiologist and a medical officer stationed at accident and emergency. However, Tamale had just one radiologist at the time of the study, he consented to take part in the study. The eligibility for radiographers and medical officers was the same as for Accra.

#### 4.3.9 Wa

Wa is the capital of the Upper West Region, it is also in the north of Ghana and both Wa and Tamale are relatively unattractive to professionals. In Wa the study recruited two radiographers and a medical officer stationed at accident and emergency, they were the only participants. There were no radiologists based in Wa, therefore none could be recruited. The criteria for selection of radiographers and the medical officer was the same as for Accra and Tamale.

#### 4.3.10 Inclusion criteria

The inclusion criteria was as follows: senior radiographers, consultant radiologists, medical officers, and a senior official each from the MoH and the AHPC who were practising in Accra, Tamale or Wa.

#### 4.3.11 Exclusion criteria

Those excluded were radiographers, radiologists, medical officers, not practising in Accra, Tamale or Wa, officials from MoH and AHPC not in Wa, Tamale or Accra and not in the senior official category or those unwilling to provide consent.



Figure 4.1 Site of study and data sources (Accra)



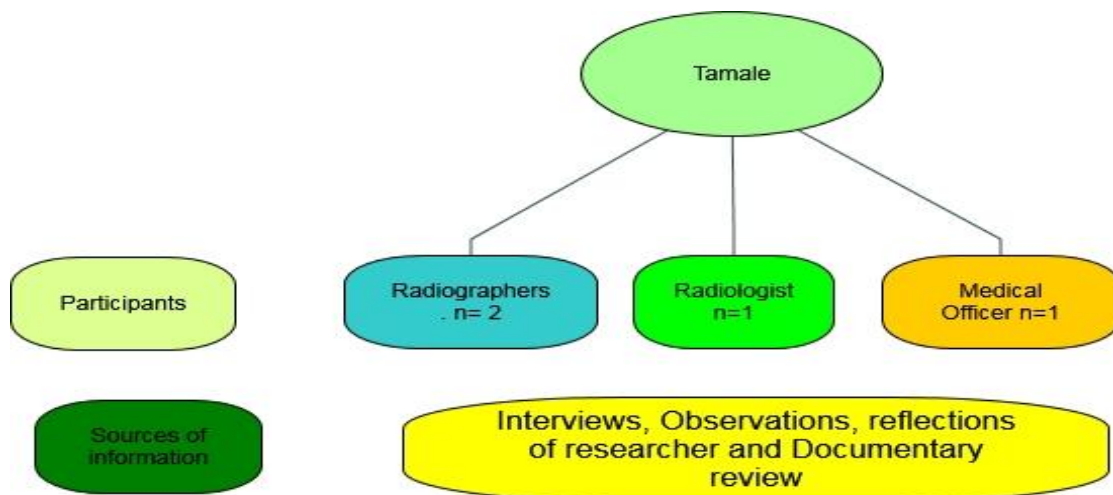


Figure 4.2 Site of study and data sources (Tamale)

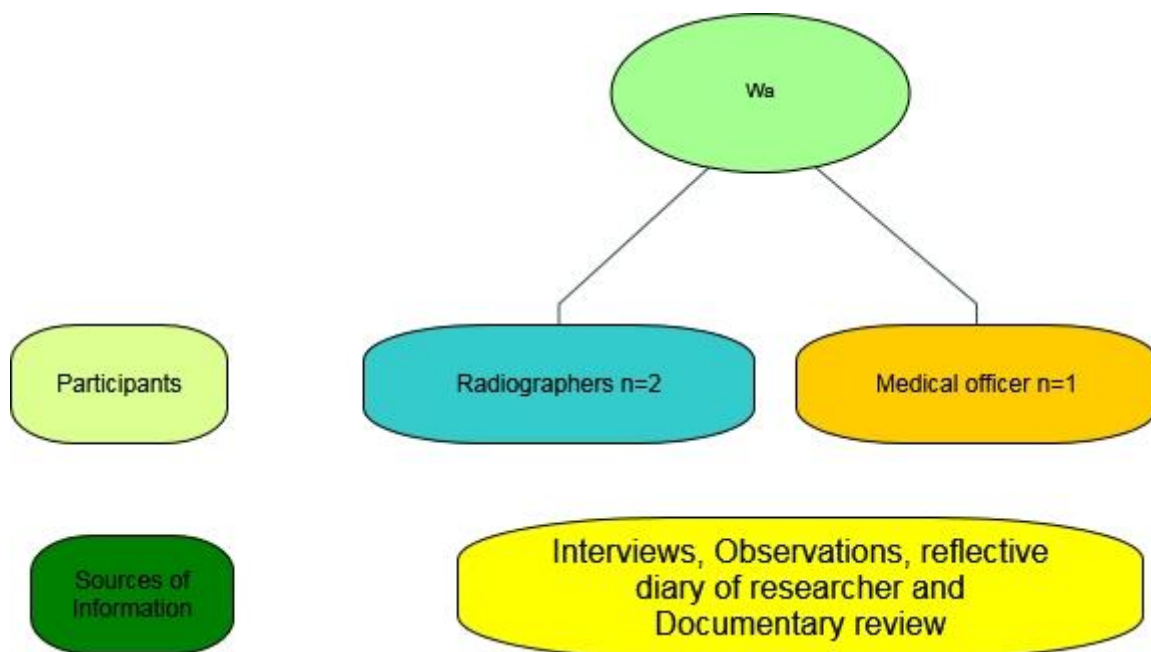


Figure 4.3 Site of study and data sources (Wa)

#### 4.4 Materials and tools for data collection

Ritchie and Spencer (2003) contend that the decision regarding which data collection method should be used is dependent on the method that is more likely to produce the required data. This study used multiple tools in data collection including in-depth interviews of participants, participant observations, review of relevant official

documents and the reflective diary kept during the study. These tools were used to ensure that data from various sources were explored and triangulated to enhance the robustness of this case study and also to answer the research question.

#### 4.4.1 Interviews

Interviews were chosen as part of the research design because the study sought to gain an insight into the role extension opportunities in diagnostic radiography in Ghana, available to the participants who are directly involved in radiography.

Interviews are a common tool used in data collection (Gill et al., 2008). In the context of this study, semi-structured in-depth interviews were best suited to explore the role extension situation in Ghana because the format is flexible and allows participants the opportunity to explain issues. At the same time it also affords the researcher an opportunity to follow up on perspectives that might be expressed by the participants in order to gain a better understanding.

Interviewing has been described by Burgess (1984:102) as 'a conversation with a purpose'. Kvale (1996) adds that the conversational nature of the interview should have a structure. All data collection in one way or another has a structure but the structure varies, largely based on the epistemological stand of the researcher, for instance exploratory interviews normally use broad questions where the respondent is encouraged to lead and direct the narrative, there are other interview types where the researcher leads and directs the respondent to areas he wants covered. In these instances the researchers knows in advance which areas they want to cover, so they can direct respondent to those areas and ensures that the same areas are covered with all respondents to eliminate any external

bias so that the objective truth is presented (Arthur and Nazroo, 2003). This study used broad questions which encouraged the respondents to lead the discussion. These broad questions were contained in an interview guide which is attached as Appendix E. However, prompts and follow up questions were used to ensure that the respondents stayed focused on the study aims. The interviewer and interviewee are central to the exchange of information that takes place during an interview. The interview process involves participants being given an opportunity to explain issues or experiences and how they interpret these issues and experiences from their perspectives.

Interviews were chosen as the research design because the study seeks to gain in-depth knowledge from the participants about the phenomenon under study. My aim as a researcher was to gather enough data to be able to answer the research question, and to achieve this using interviews. Weiss (1994) contends that the need to ask all participants the same set of questions in the same way, may help eliminate external bias but may have to be abandoned in order to allow the researcher the opportunity to probe for further explanation or dialogue.

The flexibility of the semi structured interview approach allowed for the inclusion of new themes that emerged during the interviews. The participants were asked broad questions and allowed to answer those questions. Prompts were also used in order to direct the conversation whilst at the same time allowing the participants to lead the discussion. The participants thus had the opportunity and flexibility to explain issues as they understood them. This flexibility is the key advantage in using semi-structured interviews in this study, rather than structured interviews that are rigid and lack flexibility. The use of a guide which covers broad topics based on the research question is raised by Riessman (1993)

and Patton (1997) who stress the need for questions used in research interviews to be neutral, sensitive, open ended and unambiguous. Different interview schedules and a semi structured interview guide were developed with open-ended questions, allowing for follow up probes for each professional group (See Appendix E). These broad open-ended questions were developed from literature and the study objectives. The interviews involved radiographers, and radiologists where they were available, as well as medical officers, policy makers and regulators of the radiography profession in Ghana.

The interview guide and probes were piloted in Ghana for clarity and understanding in line with Janesick's (2000) recommendation that interview guides should be piloted to ensure that they are indeed able to capture what they are meant to. Results from the pilot study led to the rewording of some of the questions, for instance a question that sought to find out why there is a need for role extension to be introduced in Ghana had to be changed from 'Why is it important to introduce role extension in Ghana' to 'What are the factors that makes it necessary to introduce role extension in Ghana'. The pilot study enabled me to bring clarity to some of the questions. This was necessary because some of the questions were ambiguous and had to be rephrased. The pilot exercise included radiographers. Those that took part in the pilot study were not part of the main study.

The interviews were arranged as face to face meetings in a quiet office at the place of work of the participants. All participants were given the option to select a location for the interviews and they all opted to have them at their place of work. However, that was not possible for one of the respondents who was the only one in that category to be interviewed, that person was out of the country and not available for the following three months. It was therefore not possible to replace him since he was the only one in that

category in the country. His interview had to be conducted via skype instead of in person. The rest of the interviews were conducted face to face. Each of the interviews lasted between 60 and 90 minutes.

The interviews were recorded with a digital recorder and transcribed verbatim. The transcription was done personally and the transcripts were sent by email to the respondents to check for their accuracy. There were no responses from any participant either acknowledging receipt or responding to the content of the transcripts. This was a pleasant surprise because all participants seemed eager to have a copy of the transcript of their interview, indeed some of them had enquired whether the transcripts were ready although at that time they were not.

#### 4.4.2 Observation

Gillham (2000) describes observation as including listening, watching and sometimes questioning the actions and inactions of participants. Observation is a method that can be used in the data collection process. This method gives a somewhat different perspective and provides an understanding of the experiences of participants that might otherwise have been missed. This method is commonly used in case studies as part of data collection, as multiple methods of data collection are employed. In this study, observation was used as a method of data collection to ensure that all the various perspectives were covered and to also ensure that perspectives that might be missed by other forms of data collection, would be captured by observation. Observations can be made using the active participation, or non-participation, of the observer. The two techniques of observation are not mutually exclusive and can be combined in a single study (Gillham, 2000). These techniques have been described as participant and non-participant observation (Mays

and Pope, 1995). Hammersley and Atkinson (1994) contend that: “*all social research is a form of participant observation because we cannot study the social world without being part of it*”.

Observational methods have their challenges. Polit and Beck, (2004) list two key challenges as observed and observer relationship and possible observer bias. They contend that the presence of someone observing them could lead to a behavioural change from the norm. This study however countered this risk by observing the participants over a long period of time (16 hours) which made it difficult for the participant to ‘pretend’ or change their behaviour. When it is not the usual practice of a participant, that person is likely to forget the presence of the observer and drift into their normal behaviour. Polit and Beck (2004) also raised the issue of observer bias. The observer could make errors, misunderstand the activity or could miss the activity altogether. They argue that objectivity in observation is difficult to achieve. Making use of a knowledgeable insider comes with the added advantage of being able to recognise the importance of subtle interactions but it can also lead to failure to note significant patterns. Hammersley and Atkinson describe this (1995:227) as a *non-observing participant*. If the researcher is familiar with the research environment, it is important to reflect on their ‘taken for granted’ assumptions and possibly look out for cases that might challenge that assumption. As a radiographer I was familiar with the research environment and was able to make a conscious effort not to take any observations for granted. The observation in this study was a combination of shadowing and non-participant observation. For instance, in observing one of the radiographers in Wa who was part of the multi-disciplinary medical team taking part in a ward round, I acted as a non-participant observer. I observed but

took no part in any of the activities and did not ask any questions. However, when I observed the same participant working within the radiology department, I asked questions for clarification on issues that I had observed.

MacDonald (2005) defines shadowing as a method whereby a researcher follows a participant over a period of time as they go about their normal duties. It involves observing and asking questions about their activities. These questions can be used to prompt the person being shadowed to explain concepts and activities. Shadowing also provides a link between observations and interpretation. I was introduced as a radiographer who was conducting research and I wore a white jacket (laboratory coat) during the period of shadowing. This involved ward rounds with the medical officers and once with the radiologists. The radiologists generally were not part of these ward rounds. The radiologists however explained that due to their numbers they would not normally take part in ward rounds. I was also a non-participant observer during the consultation period for the medical officers.

Adler and Adler (1994) contend that observation as a method of data collection has been criticised for not being transparent. They argue that it is not open for external scrutiny as a recording or transcript of an interview can be. They therefore suggest the use of multiple observers so that findings can be compared. This remedy has however been criticised by Coffey (1999) who asserts that observation is not a neutral act but experiential and sometimes emotional, meaning different observers will generate different data. Credibility is dependent on the ability of the researcher to reflect on his or her influence on the data collected. I agree with Coffey (1999) that observations are dependent on the person doing the observation and as such the credibility of the process is largely

dependent on the researchers' ability to reflect their own influence on the data. I thus paid close attention to the influences that I might have on the data.

Mays and Pope (1995) note the importance of observational research in studying the roles played by different groups and how they relate to each other. It was used by Strong and Robinson (1990) in their case studies examining the introduction of general management roles in the National Health Service (NHS) in the UK. This study made use of both participant and non-participant observation. Spradley's (1980) framework was used in taking notes of observation thus making notes under the headings of people, places and events. An extract of the observation is attached as Appendix F.

#### *4.4.2.1 Who was observed?*

This study sought to observe radiographers, radiologists and medical officers. Each participant was interviewed and then observed over a two-day period of an eight-hour shift as they went about their normal duties.

The radiographers were observed as they practised within the radiology department and if they had to perform any other duties outside the department they were followed and observed. Two radiographers who were involved in higher education were also observed performing their duties in academia. The observations were used as a means of gaining insight into how these participants carried out their duties in the face of the lack of phantoms and teaching aids. It was also to gain insight into how some of the modalities that do not exist in Ghana are explained to the students to ensure that they understand.

The radiologists were observed as they performed their duties within the radiology department and any other department within the hospital where they had to perform



duties. One of the radiologists was involved in the education of radiographers so he was observed lecturing the student radiographers, whilst another radiologist was involved in the education of medical students on basics of image interpretation and I sat through that three-hour lecture as well. The medical officers were also observed as they performed their duties within the hospital.

Two participants were not observed, the representative of the MoH and the representative of the AHPC. This was mainly because I had come to the conclusion that observing the representative of the MoH was not going to add anything significant to the findings. The representative of the AHPC also fell into the same category. The objective of observation in the study was to observe at first-hand how the participants went about their duties in clinical practice and when teaching radiography students, these two officials were not involved either in clinical practice or teaching of radiography. I therefore came to the pragmatic decision that observing the two was not going to add anything significant to the study findings.

#### *4.4.2.2 What was observed?*

Mason (2002) asserts that deciding what to observe and what not to observe can be a daunting task and it is not possible to observe everything. Observation therefore requires the researcher's discretion when deciding what and whom to observe and the role the researcher plays in the observation is critical.

In this study, I sought to observe the everyday practice of radiographers, radiologists and medical officers, as well as radiography educators. For the radiographers, the study sought to observe how they went about their practice, what additional roles they had

taken up beyond their scope of practice at registration and the extent to which they were supervised when performing additional roles. The observations also focused on how they interacted with and related to other professionals (such as radiologists, medical officers and nurses) and whether their views were sought by other professionals on the images they produced, and any other activities relating to radiography practice that were of interest to the study. The radiographers involved in higher education were also observed performing their academic related duties. One of the participants was observed whilst lecturing to radiography students. I observed how radiographic positioning technique was taught to students without the aid of phantoms and teaching aids. The teaching of other modalities that do not exist in the country was difficult in some instances. The participant engaged in teaching students about Positron Emission Tomography (PET) had to use pictures as there is no PET scanner in the country.

The radiologists were also observed as they went about their normal duties within the hospital. This involved following them to clinical meetings amongst others and observing the way they interacted with and related to other professionals within the hospital. The way in which they went about their reporting duties and how they balanced time for reporting of radiographs and performing of complex time-consuming examinations like MRI examinations or interventional procedures. One of the radiologist participants involved in both clinical practice and higher education was also observed during a lecture with final year radiography students. I sat in throughout the lecture and observed. The materials that were used for the lecture, how interactive the lecture was, the type of images that were used for image interpretation, the way in which pattern recognition was

taught, especially in cases where there were no images to demonstrate and if any of what was being taught promoted or supported advanced roles in any way.

Lastly, the medical officers were observed whilst they went about their normal duties. This included ward rounds, clinical meetings, and patient consultations amongst others. Their interactions with other professionals within the hospital were also observed. How they incorporated the interpretation of radiographs that were not reported on, as well as those that were reported, was observed. In all cases questions were asked when there was the need for clarification.

#### *4.4.2.3 How long were the observations?*

Each of the participants was observed for two eight-hour shifts (16 hours). This included reporting to the hospital before the start of work and shadowing the participant throughout their shift. The lunch break was included as part of the observation as that gave additional time to ask questions about incidents that might have happened.

However, the radiologist in clinical practice, who was also involved in the education of radiographers, was observed for eight hours in clinical practice and I also sat in his class as he taught the final year radiography students pattern recognition and image interpretation. The lecture was three-hours in duration so in total he was observed for eleven hours.

Additionally, of the two radiographers involved in higher education, one was involved in clinical practice as well as in higher education. His observation therefore covered both his clinical practice and performing his duties in higher education which involved lecturing students and also acting as a supervisor for their dissertations. During the period of the

observation the participant did not have teaching sessions with students, apart from the supervisory meetings, so there were no observations of a lecture for this participant. He was thus observed for a total of ten hours, eight hours of clinical practice and two hours of supervisory duties. The second radiographer involved in higher education was not involved in clinical practice, so he was basically involved with administrative work and lecturing. He had two 3-hour lecture sessions over the two day period, I observed him and I sat in during both lectures for final year students. He was observed for six hours.

#### *4.4.2.4 Analysing and reporting the observation data*

The findings were reported using field note extracts and following the people, place and events framework proposed by Spradley (1980). Extracts were used to explain the issues that arose in the interviews and to clarify points during the interviews. These extracts indicated the participant being observed, the place that the observation took place and the event that was observed. This provided context to the data that was gathered through observation. The data generated through observations was coded in the same way as the interview transcripts and integrated with the other sources of data.

#### **4.4.3 Documentary analysis**

Bryman (2004) suggests that formal documents have the added advantage of being written without prior knowledge of the fact that they will be used for research. These formal documents give information about the organisation's cultural and technical practices. Marwick (2001) suggests that no matter how documents are presented, they represent an additional viewpoint and therefore can be very important in case studies. The process of selection of documents for review was a pragmatic one. It was based on

availability and relevance. The availability was based on which documents were publicly available and what officials were willing to provide. This is because at the time of the study Ghana did not have a right to information law that would oblige public officials to make available the documents requested. Relevance was determined based on the study objectives.

The study objectives were used to develop a criterion to identify sources of documents. These sources included, the MoH, GHS, AHPC, the GSR, University of Ghana School of Allied Health Sciences and the World Health Organization (WHO).

The websites of the various organizations were searched for documents relevant to the study. Information on the most current staffing levels within the health sector in Ghana were not readily available on either the GHS or MoH website but were found on the website of the National Development Planning Commission (NDPC) ([www.ndpc.gov.gh](http://www.ndpc.gov.gh)), this source was not initially considered. The GSR provided some very important documents. The documents were requested from the GSR and were supplied. This website of the AHPC ([www.ahpcghana.org](http://www.ahpcghana.org)) provided documents on the functions and activities of the council. A detailed analysis of these documents was undertaken concurrently with the interviews whenever possible, giving an opportunity to follow up on documents with the participants. A list of documents that were reviewed along with their titles and the dates that they were written is attached as Appendix I. As stated earlier these documents were selected based on availability and relevance and determined by the study objectives.

The documents reviewed gave some perspectives into the 'shortage of radiographers' and actions that were being taken to address the situation, a perspective was also gained on

the consultation processes that are engaged in formulating policy and the challenges that are being faced by the AHPC in performing its functions. This was done because Bowen (2009), in proposing purposes for which documents are analysed, listed five purposes which include:

*Providing a context within which participants operate*

*The possibility of finding information in documents that could give a lead on which questions to ask.*

*The ability of documents to provide supplementary data*

*The ability of using documents to track change and development*

*The ability of analysing documents to corroborate evidence from other sources. (pg. 29-30)*

The main purpose for doing a documentary analysis was to further add data from another source to the interview and observation data.

Data collection took place over a period of three months, this included interview data, documentary data and observational data. This was undertaken concurrently as much as was possible. This was however preceded by the recruitment of participants and seeking access to the various sites for the study. The process of recruiting participants and gaining access to the three sites of study was done over a period of three months.

#### 4.5 Triangulation of Data

Data from interviews, observations, documentary review and my reflective diary were integrated to produce a more coherent report. Interview data, for example, provided an insight into the perspective of the participants, observation data provided an insight into

how participants went about their day to practice, documentary data provided policy position, decisions taken on various issues and the way in which issues are handled within healthcare in Ghana. My reflective diary provided me with the opportunity to reflect on all decisions taken in the process of this study and to re-examine every single action or inaction. Reflection also ensured that steps were taken to remove any personal bias. Triangulation involved cross referencing and comparing data from the various sources for corroboration or discord. For example, when being interviewed radiographer participants argued that medical officers were given preferential treatment by the MoH and GHS compared with radiographers. This view was supported by official documents (Letters from the Director General of the GHS to regional and district directors of the GHS) from the GHS relating to instances of medical officers and radiographers both refusing to accept postings to rural communities. Review of the documents showed that in the case of the medical officers the GHS offered incentives to attract them to the rural areas, whereas in the case of the radiographers the various health facilities were directed to instead recruit unqualified persons to operate the radiography equipment. Radiographers had also indicated in interviews that they were not granted permission by the GHS to attend CPD programmes but the medical officers were granted permission to do so. This is supported by documents from the GHS encouraging health facilities to sponsor medical officers to attend CPD programmes. Again, through observations it was found that some radiologists use official time to perform their private duties. This was not disclosed in either interviews or documentary reviews. Such information would not have been picked up but for observations. It was also observed that radiographers were performing tasks beyond their scope of practice as defined by Scope of Practice at Registration document from the AHPC,

this was confirmed during interviews with radiographers. The integration of data from all the sources therefore gave a more coherent and holistic insight into the radiologist shortage in Ghana and evaluated ways of addressing this. Appendix M gives a schematic presentation of how triangulation was achieved.

#### 4.6 Data analysis

One of the key aspects of the research process is data analysis. Depending on the way in which rigorous data analysis is done, the research has the potential of producing results that will contribute to new understanding of phenomena (Pope et al., 2000). The new findings once disseminated will then be put under scrutiny by questions being asked of it, this could result in further research and ultimately bring about change. There are several analytic strategies used within case study research and one of these is within and across case analysis (Yin, 2017).

It is very important in case study design for the researcher to identify themes that are relevant in individual cases and those that cut across cases. This is particularly important because it plays a central role in data analysis. This also makes it easier for the researcher to clearly state which themes are specific to some participants and which themes are relevant to all participants (Ayres et al., 2003).

In case study methodology the quality of data analysis is very important (Silverman, 1993). This is because the methodology makes use of multiple sources of data, which are all important once properly integrated into the analysis. Data were collected from interviews, observation, documentary reviews and a reflective diary.



Analysis was guided by the study objectives but did not overlook the emergence of new themes from the data which could challenge or change the focus of the study. Qualitative approaches are many and varied, and thematic analysis should be seen as a 'foundational method' in qualitative analysis (Braun and Clarke, 2006).

Attride-Sterling (2001) contends that development of thematic networks, by which data are linked at different levels, is commonly used. Thematic analysis has the potential of providing a complex, detailed and rich account of data (Braun and Clarke, 2006). Thematic analysis is relatively flexible as it enjoys theoretical freedom. It is not restricted by theory and epistemology. This freedom makes it a very useful tool for research with the potential of providing a rich and complex data source (Braun and Clarke, 2006). Thematic analysis can be either inductive or theory driven, however it is noteworthy that researchers cannot completely free themselves of their theoretical and epistemological stands even when they are conducting inductive thematic analysis. Often the choice between the two types is dependent on how and why the data is being coded. Coding can be done for specific research questions (theoretical approach) or the questions can evolve from the coding (inductive approach) (Braun and Clarke, 2006). This study used an inductive thematic analysis approach because the analysis process was not guided by pre-determined theory that the data had to be coded in order to meet. Additionally, the coding was not done to fit into a pre-existing coding frame developed out of my preconceptions (Braun and Clarke, 2006). Braun and Clarke (2006) provide a six-phase outline guide through which thematic analysis should go. This guide was used in the study. An example of the way in which coding was carried out is attached as Appendix G.

The coding of data involved data from interviews, observations, documentary review and my reflexive diary. Each source of data was given the same level of importance. After data from all sources had been coded, similar codes were grouped together to form a coherent subtheme. Similar subthemes were then drawn together as a worked example (Appendix N) of how the first part of the 'challenges to professional practice' theme was generated. It also shows how data from the various sources were integrated.

The six phases of thematic analysis as proposed by Braun and Clarke (2006) are as follows:

*Familiarising yourself with the data*

*Generating initial codes*

*Searching for themes*

*Reviewing themes*

*Defining and naming themes*

*Producing the report.*

#### 4.6.1 Familiarizing yourself with the data

When data is collected by the researcher personally, through an interactive process, the researcher comes to the analysis with some prior knowledge but that notwithstanding it is important that the researcher immerses his or herself in the data so that they become very familiar with the depth and breadth of the data (Braun and Clarke, 2006). For this study, I conducted and transcribed the interviews, this was where the process of familiarizing with the data started (Riessman, 1993). I listened to the audio recordings of the interviews as soon as it was possible to do so and proceeded to transcribe them. I then read and reread the transcripts several times so as to understand the depth and breadth

of the transcripts. There were 16 interviews which came to a total of about 20 hours. The observations amounted to 203 hours, whilst the total number of words inclusive of reflective accounts was about 205,000. All data generated from the various sources was integrated at an early stage. The documents were each treated separately as with the interview transcripts. The reflective diary as a whole was also treated as a single document. One of the interview transcripts is attached as Appendix H.

#### 4.6.2 Generating initial codes

This was undertaken immediately after I had familiarised myself with the data. By this time, I gained an understanding of what was contained within the data and what might be relevant to the study. Initial codes are generated from the data, however, the method for developing these codes is dependent upon whether the themes are data driven or theory driven. Codes represent an aspect of the data that appears relevant to the analysts and is the most elementary form of the raw data which can be assessed in a meaningful way about the phenomenon (Boyatzis, 1998). Coding can be done manually or through the use of software, this study was done using software (NVIVO 11), and Yin (2009) contends that this software does not actually perform the analysis but simply assists in doing the analysis, unlike statistical analysis software. However, there are clear advantages with using the software for analysis because it saves the researcher a significant amount of time, especially when dealing with large volumes of data and it also brings rigour (Silverman, 2010). NVIVO as a software tool is used to store and organise data from various sources on one platform for easy access and usage. NVIVO can also be used to categorise and analyse data and can export data to other software such as SPSS for further analysis. It can also be used to visualise and draw mind maps with linkages

between various aspects of the data. This study produced a relatively large amount of data from the various sources and the software helped with the organisation and analysis of the data. Coding was done systematically line by line and each data set was given the same attention, parts that were relevant to the research were then coded (Braun and Clarke, 2006). Coding was driven by data because the analysis process was inductive. Inductive analysis is dependent on the data and the codes generated are driven by the data and not preconceived theories. The initial codes were largely descriptive in nature.

#### 4.6.3 Searching for patterns

I began searching for themes after all the data had been initially coded and the codes had been collated into a list. The codes were sorted and aligned into potential broad themes with all the data under each of the codes that had been grouped under a potential theme, being pulled together under that theme. Initial mind maps were made for the initial themes that were developed by grouping some codes together. This was used to help draw relationships between codes and between themes and sub-themes within those. Some codes became themes, others became sub-themes and some were completely discarded. There were a few codes that did not seem to fit into any of the themes so they were labelled as miscellaneous and put under that theme.

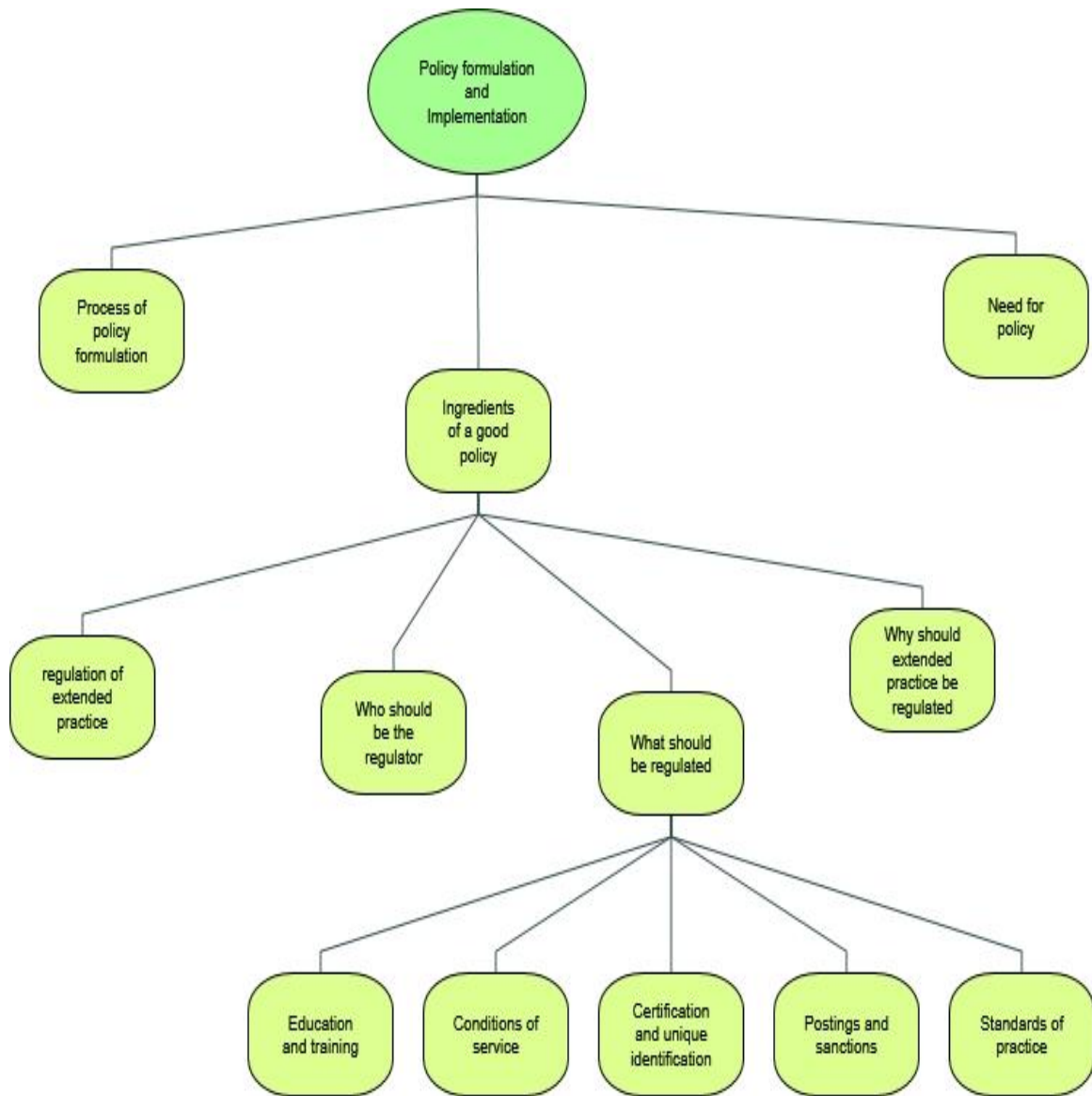


Figure 4.4 Mind map for policy planning and implementation

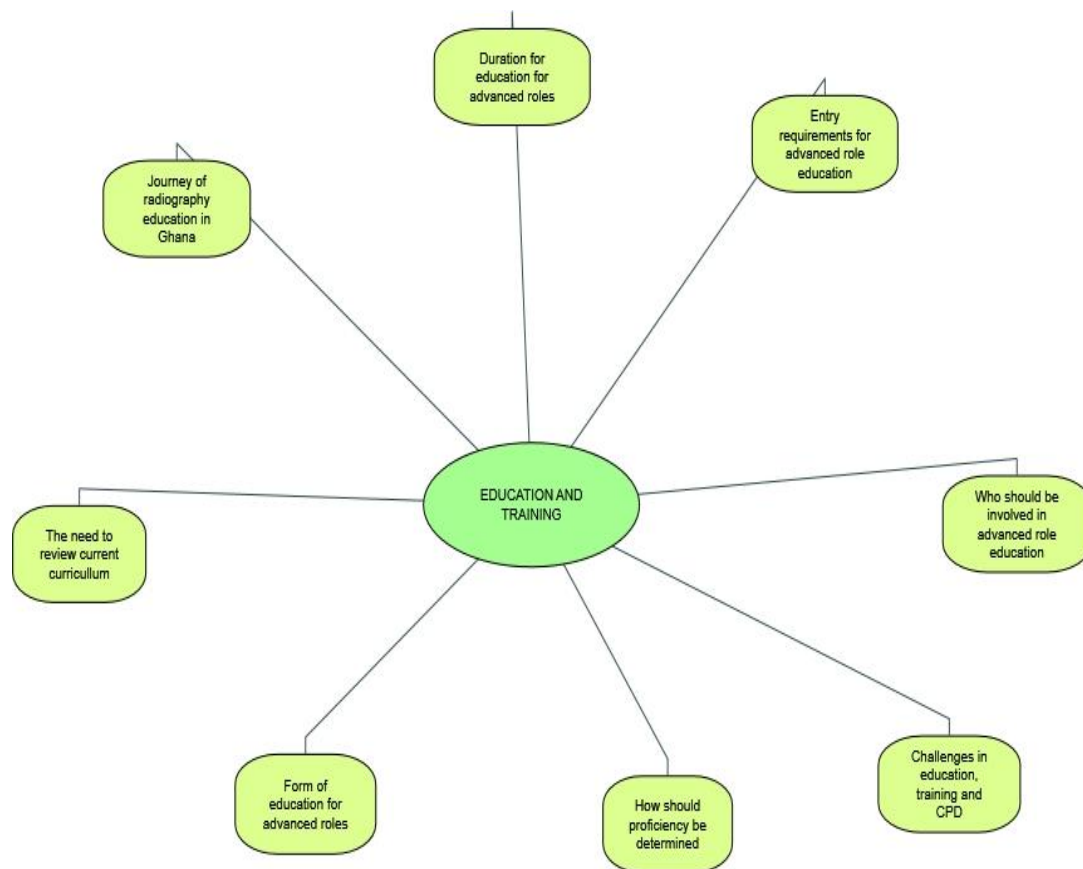


Figure 4.5 Mind map for education and training

#### 4.6.4 Reviewing themes

The themes that were formed in the previous phase were refined to ensure that there was both internal homogeneity and external heterogeneity. Internal homogeneity meaning the data within each theme should coherently be meaningful, while external heterogeneity on the other hand, meaning that there should be a clear distinction between the themes (Patton, 1990). In refining the themes I ensured that there was

coherence of the data within each theme and there was a clear distinction between the themes. Some themes had to be broken up and some were also merged. For instance, there was a theme for policy formulation and training but in reviewing the various themes it became clear that training could be captured under education. Training was thus collapsed and included in the education theme which now became education and training. Again, there was a theme named factors accounting for the introduction of role extension in radiography in Ghana and another named challenges to professional practice. When the two themes were reviewed it was realised that the two could be combined since the factors accounting for the introduction of role extension in diagnostic radiography were also challenges to professional practice. By the end of this phase a clear idea of how the various themes fitted together and the story they told about the data had become apparent.

#### 4.6.5 Defining and naming themes

In this phase there is further refining and defining of the themes that will be used in the analysis. The themes are defined in terms of what they are about, relevance or importance and a determination is made of the aspect of the data that the theme captures. The story told by each theme was analysed and woven into the general story of the data to make it coherent. The structure of each theme was refined to ensure that there was a flow to the structure. The names of the themes were reviewed in this phase to ensure that they were concise and that they gave the reader an idea of what the theme is about.

#### 4.6.6 Producing the report

The final phase is producing the report. The report must be analytic and should also include vivid extracts from the data as examples. 'It should be consistent, coherent, logical and non-repetitive and form an interesting account of the story the data tells' (Braun and Clarke, 2006). In producing the report extracts were provided that demonstrated the presence of the themes in the data in very simple terms. The write-up went beyond just reproducing extracts by being analytical. An example is when a participant, in responding to a question, argued that medical officers do not have the required training to interpret images and further argued that radiographers are better at image interpretation than the medical officers. However, he was reluctant to advocate for radiographers to be given further education and mandated to interpret images. He argued that because they do not have a medical background they cannot interpret images. The same participant had earlier argued that medical officers who have a medical background cannot interpret images but now argued that radiographers should not interpret images because they do not have a medical background. The varying responses he gave were critically analysed in order to gain an understanding of his reluctance to advocate for radiographers being allowed to interpret images.

Within the themes it was easy to group themes that cut across themes for discussion, memos that were kept during the research process were used to place interaction in context and therefore put some statements in context. The non-verbal communication was mostly captured by notes taken during the whole research process and they became useful at this point.



#### 4.7 Issues of quality in research

Eisner (1991) argues that a good qualitative study can help us 'understand a situation that would otherwise be enigmatic or confusing' (pg. 58). The issue of demonstrating the quality of research has been a challenge for qualitative researchers. Qualitative researchers have varying philosophical positions from realist to relativist, with each having their own definition of what rigour means. Rigour has been associated with validity and reliability over the years. Yin (2003) with a positivist stand, proposes the use of a detailed protocol in case study design, to ensure rigour. Some authors like Stake (1995) argue that the flexibility of case study design enables the researcher to gain deep insight which is an advantage over a standardised protocol. Lincoln and Guba (1986) proposed that constructivists need to have criteria for evaluating the quality of research which is different from the traditional one used by social science. They proposed the use of credibility instead of internal validity, transferability in place of external validity, dependability for reliability and confirmability in place of objectivity. They go further to suggest that the combination of all these features addresses the issue of trustworthiness (Eisner, 1991) which is in a way similar or the same as rigour (Morse, 2002).

In the context of this study, particularly with its design and the philosophical underpinnings, I am firmly convinced that the position of Lincoln and Guba (1986) of using credibility, transferability, dependability and confirmability is best suited for this study. This is because of the traditional view of associating reliability and validity with the quantitative research paradigm.

#### 4.7.1 Credibility

Some authors have argued that there are many ways of demonstrating the credibility of research. Credibility is said to be established when the research findings can be clearly linked to the reality and thus demonstrate the truth of the study findings. Lincoln and Guba (1986) contend that credibility of research can be enhanced by either data triangulation or 'member checking', whereby findings are sent back to respondents for confirmation.

Member checking was carried out but none of the participants responded within the study period. The triangulation of data in this study helped me to analyse data from a number of different perspectives which increased the trustworthiness of the study as some similar threads were identified. Peer debriefing was used throughout the study and even though it did not confirm credibility, it served as an important guide. The findings and interpretations were always subject to peer debriefing by discussing them with supervisors and other colleagues as a way of enhancing credibility.

#### 4.7.2 Transferability

This study does not seek to provide data for statistical generalisation so transferability is achieved only by theoretical generalisation. Theoretical generalisation is defined by Coffey and Atkinson as:

*'Transcending the local and the particular. Abductive inferences lead us from specific cases or finding toward generic levels that allow us to move conceptually across a wide range of social context'*

The nature of the design and method of the study has produced ‘thick’ descriptions which have resulted in the production of in-depth data extracts. These extracts are within a context which provides very rich information which could be transferable to other cohorts. This is largely because of some examples which were common amongst the participants and increased the possibility of transferability.

#### 4.7.3 Dependability

Triangulation and integration of data from different sources can help enhance dependability. In this study the analysis was conducted such that each piece of material was coded in the same way and as such it was possible to see replication of different types of data within the results for each code used for the participants.

The written reports were shared with the supervisors for discussion. It was not possible to use inter-rater reliability in this study as there was only one researcher. The study did not use an external audit process due to time and resource constraints.

#### 4.7.4 Conformability

The study was guided by the use of a protocol to plan and execute it. The study therefore has an audit trail which reinforces the fact that the study was planned and executed. Researcher bias was minimised by putting in place measures that encouraged researcher reflexivity, this ensured confirmability of the research findings.

#### 4.8 Reflexivity

Data is generally deemed by interpretive researchers to be generated and not discovered (Silverman, 1993; Mason, 2002). It is also believed that the researcher has an impact on

the way data is generated by the way he/she presents themselves with regards to their personality and how it is revealed (Stake, 1995). Social psychologists contend the importance of social identity at work (Haslam and Platow, 2001) and the effect of being identified with certain groups at work. My professional role and standing meant I was an insider in radiology, and this possibly would have influenced the way and manner of the interviews and observation sessions. Reflexivity is critical in qualitative research because the researcher acts as a primary instrument of data collection and analysis (Holloway and Wheeler, 2010; Stake, 1995). However, a research diary was kept to record my reflections, assumptions made and the possible impact upon the data. The reflections included some non-verbal communication that took place during the research process and also included actions that might have been taken during the course of the research. Memos were also kept during the data analysis phase as a means of reflecting on the analysis process.

A researcher, being an insider, has the potential advantage of easily gaining access, trust and openness from the group under study than someone who is seen as an outsider. Participants are more likely to be open with an insider because there is an assumption of understanding and there could be the feeling of 'us versus them' and they don't understand us (Dwyer and Buckle, 2009).

Regardless of the advantages of being either an insider or an outsider as a researcher, both impact on the data collection and interpretation process (Stanfield, 1994) and the need for a researcher to reflect on their identity is critical (Silverman, 1993). I was seen as an insider because of my previous roles as a radiographer and also as a past general secretary for the GSR. It is argued that when the researcher belongs to the social group being studied, there is always a very good rapport between the researcher and the

participants which results in the participants opening up to the researcher. This could lead to data that would not normally be accessible to an outsider (Bonner and Tolhurst, 2002). The potential to increase validity in insider research is mainly due to the added honesty and authenticity of information provided by respondents (Rooney, 2005).

There is however the potential for insider researchers to make errors, such as selecting informants who are known to them and also the possibility of making assumptions during interviews, which could result in not probing further as an outsider might do. There is the possibility of bias from the researcher due to their personal experiences and familiarity which could also lead to a failure to fully explore individual experiences. This has the potential of influencing data analysis. Being a radiographer myself, there was a risk that I might select radiographers known to me. This risk was however minimised, as recommended by Brannick and Coghlan (2007), by inviting all radiographers who qualified to partake in the study. I also ensured that participants who consented to take part were selected based on availability within the limited time for data collection. It was ensured that there was no bias in selection of participants. I also ensured that at all times during the interviews assumptions were not made and further questions were asked for clarity on issues. As the study progressed I realised that in one instance I had been diverted from my research agenda as I engaged one of the participants in a debate on an opinion he had shared, instead of just listening and asking probing questions. Reflection following that interview guided me to stay as neutral as possible as a researcher. In another instance a participant had decided that the interview should be conducted at 8am at their place of work, before the department became busy. However, the interview was interrupted a few times for the participant to help out with work in the department. Following reflection on

this I decided to arrange for the next participant to be interviewed at the end of their working day in order to avoid any interruptions and this worked perfectly. An extract from the reflections of the researcher is attached as Appendix K. Additional steps taken to ensure that being an insider did not unduly influence the research process include the use of strict bracketing of my role as a researcher and my background as a radiographer and continuous reflection on the research process. Being aware of the possible personal bias and perspective is one method which was used to reduce any possible bias in the study process. Again, Dwyer and Buckle (2009) argued that it is important to ensure personal biases were managed, by being open-minded, honest, very interested in the perspective of the participants and committed to reporting their perspectives precisely and accurately. This admonition was followed to the latter.

#### 4.9 Ethics, consent and confidentiality

It is very important that stringent measures are put in place in terms of ethical considerations which will ensure the safety of the public when taking part in any form of research (Orb et al., 2001). The Cardiff University Research Governance Framework (2010) seeks to ensure that research is governed by very high ethical regulations that guarantee public safety and the wellbeing of participants in the research.

Before the research commenced, the researcher had to satisfy the requirements of the Ethics and Research Committee of the School of Healthcare Studies, Cardiff University, and that of GSR. The process was made simpler when the Ghana Radiologist Society and the GMA did not require that I apply for further permission from them in order to interview their members, once I had permission from the Ethics and Research Committee of the School of

Healthcare Sciences, Cardiff University (dated 11<sup>th</sup> October, 2017) Appendix A and also from the GSR Appendix B.

#### 4.9.1 Consent

All participants at the point of indicating their willingness to take part in the study were given a consent form to sign. The consent forms contained information about the study and a point of contact for any further questions and clarification. Potential participants were allowed a two-week period to decide whether they wanted to take part in the study. Verbal consent was obtained from the participants prior to the start of each interview and the process of the interview and observation were explained once again.

#### 4.9.2 Confidentiality and anonymity

The information provided by the participants did not reveal their identity. The interpretation of the data also did not reveal their identity. Confidentiality was maintained throughout the study period and the data at the point of collection was saved on the personal laptop of the researcher which was password protected and stored in a folder on the laptop which was also password protected. Once the data collection was complete and the researcher returned to the UK, all data were stored on the Cardiff University computer which was password protected and the researcher was the only person with access to it. The records were stored in accordance with the University's management of data of research records (Cardiff University, 2011).

However, in one particular case, the participant was the only person qualified at that site at the time of the study. It was explained to him that it would not be possible to provide complete anonymity in his case. He agreed to proceed with the study and indicated that

recruitment processes for other qualified staff to the site were almost complete so it would not be a problem.

The participants were informed that in the event of a judgement being made that indicated there was risk of significant harm to the participant or the wider public, I could disclose information to the relevant authority without the consent of the participant and within the legal framework of Ghana. However, it is noted that the best practice would be to get the consent of participants before disclosing confidential issues. Each participant was interviewed at an enclosed and secured place of their choice which was mostly within the hospital.

#### 4.10 Conclusion

The chapter describes the development, design and conduct of the study and establishes the epistemological position and reasons for that position. Case study methodology was used to conduct the study. The case study methodology was selected because it enabled the provision of in-depth and detailed study of a phenomenon within a context and provided an empirical mode of enquiry and many other justifications provided in this chapter. The decisions about sampling and selection of sites were made based on the study objectives. Pre-determined quotas for the various professions were selected for the study and this informed the number of participants in each profession. The study sites were selected to represent areas with the highest number of radiologists, areas with the lowest number of radiologists and areas with no radiologists. The chapter also discussed the way in which the data were collected by multiple sources using various tools such as interviews, observations, reviews of relevant official documents and also my reflective diary. Data from these sources were analysed using thematic analysis. The



computer software NVIVO 11 was used to store or organise and code the data, it was also used in drawing initial mind maps to aid with analysis. Ethical issues are addressed in the chapter as I had to apply and be granted ethical clearance from the ethics committee of the School of Healthcare Sciences of Cardiff University and the GSR before proceeding with the study. Participants were assured of confidentiality and anonymity throughout the research process and measures taken to ensure anonymity and confidentiality are outlined in this chapter. The issue of quality in research was also explained. The chapter also serves as an audit trail of how the study objectives guided the methodological design and therefore makes it possible for readers to determine the credibility and trustworthiness of the study. The next three chapters will discuss the three themes resulting from the coding of the data.

## Chapter Five

### Challenges to professional practice



Figure 5. 1 Schematic structure of the first part of challenges to professional practice.

Challenges to professional practice as a theme has been divided into two parts for ease of discussion. The first part which is shown in Figure 5.1 above is made up of challenges to professional practice, they do not serve as factors that promote the introduction of role extension in diagnostic radiography. These subthemes include; equipment procurement and maintenance, staff shortages and discriminatory practices, shortage of consumables and lack of basic facilities and services. This part discusses challenges to practice resulting from procurement practices and a poor maintenance culture in the various sites of the study. The issues of procurement practices and a poor maintenance culture are pervasive in all the sites. Shortage of staff and discriminatory practices against radiographers is also explored; shortage of consumables and lack of some very basic facilities and services at some of the sites is also discussed in this section.

Concluding this section is a discussion on challenges faced by the regulator of allied health practice in Ghana, the AHPC.

## Part 2

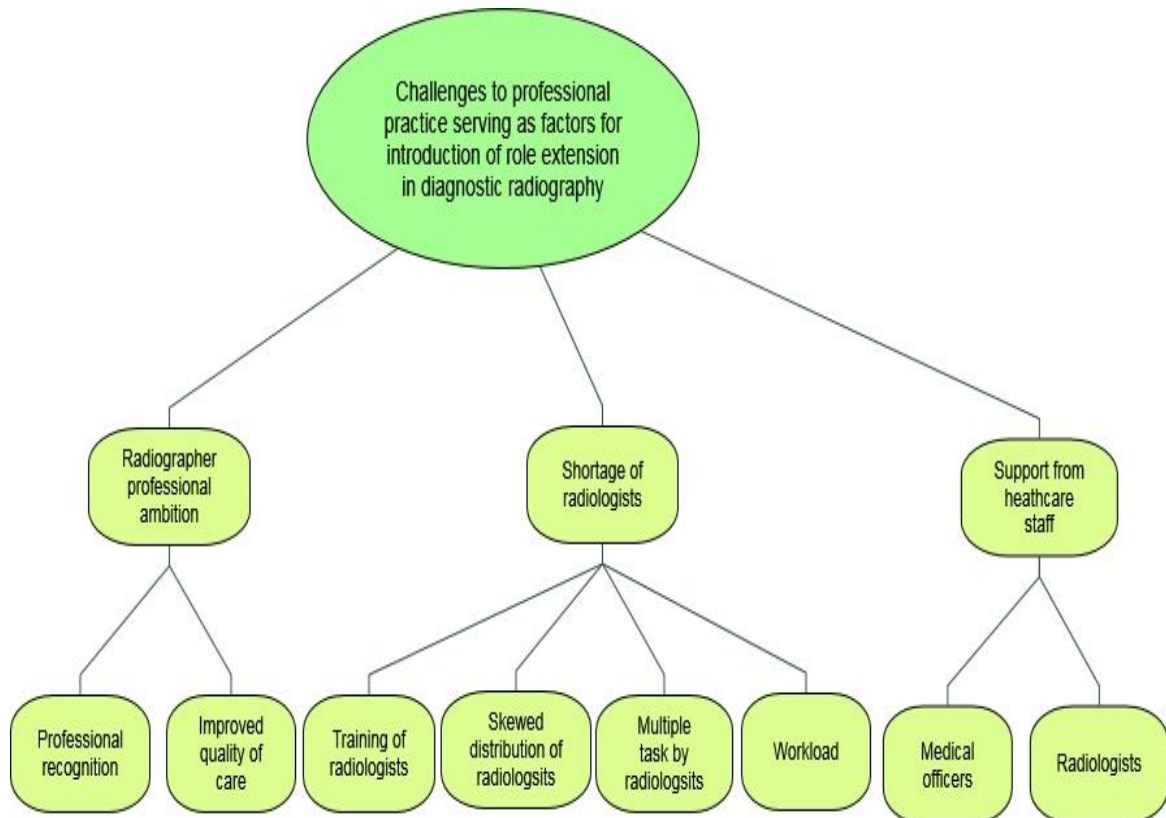


Figure 5. 2 Schematic outline of the second part of challenges to professional practice acting as push factors for role extension

The second part of the theme as shown in Figure 5.2 explores challenges to professional practice that also serve as factors which promote the need to introduce role extension in diagnostic radiography in Ghana. The discussion is divided into three subthemes; first, radiographer professional ambition, discussed under professional recognition and possible improved care to patient. Second, the shortage of radiologists, discussed under

the various causes of the shortage, these include the limited training capacity, skewed distribution of the few available, multiple tasks undertaken by radiologists and the resulting workload. Finally, support enjoyed from healthcare personnel in respect of the introduction of role extension which is discussed under the views of medical officers and radiologists.

## 5.1 Introduction

This is the first of the three results chapters that explore themes identified from the data. These themes are common across the sites and/or professions in the study. The data were generated from interviews, observations of participants, the researcher's reflective diary and a review of relevant and available government documents.

The experiences of the various professionals were understandably different, especially because they were in different professions and worked at different sites. The experiences were usually similar for any particular professional group at the same site, there was also a general sense of unanimity in some aspects of their experiences in professional practice and the opportunities that exist for role extension in radiography in Ghana, regardless of the site of practice or profession. An example is the acceptance that there is a shortage of radiologists across the country with a skewed distribution. There is consensus on the need to find a solution to the problem of unreported radiographs one way or the other, the point of contention concerns the best solution.

This chapter will explore in depth the challenges encountered by the various professionals in line with performing their professional duties and how these impact on the quality of care that patients receive. It will also explore how these challenges could serve as

contributory factors or opportunities for the introduction of role extension in diagnostic radiography in Ghana. The chapter is in two parts, the first part (Fig. 5.1) explores challenges to professional practice and the second part (Fig. 5.2) discusses challenges that could serve as factors or opportunities for the introduction of extended practice in diagnostic radiography in Ghana. Some of the challenges encountered in professional practice might not serve as factors or opportunities for the introduction of role extension in diagnostic radiography but will need to be addressed if the introduction of role extension is to be successful. Any such challenges will be part of the first section of the chapter. The first part will discuss these challenges under the following sub-themes: **equipment procurement and maintenance, staffing shortage, workload and discriminatory practices, shortage of consumables and lack of basic facilities and regulatory challenges** to conclude the first part. The second part will explore the challenges under the following sub-themes: **shortage of radiologists, radiographer agitation and support from other healthcare professionals**. This will give an insight into the type of challenges that are faced by healthcare professionals in line with their roles.

## 5.2 Equipment procurement and maintenance

The Public Procurement Act 663, 2003, governs public procurement in Ghana. The Act requires public agencies to have a procurement entity that is responsible for all procurements under the agency and should be done according to the requirements of Act 663. Part II section 15 (3) of the procurement act states:

*“Procurement decisions of an entity shall be taken in a corporate manner and any internal unit concerned shall contribute to the decision making process” Public Procurement ACT 663 2003 (Document).*

The provisions in Act 663 are elaborate and detailed. However, some provisions in the Act are open for abuse by corrupt officials. The Act makes provision for tendering for procurement to be either competitive, restrictive, single-source procurement or two stage tendering depending on what is being purchased and the exigencies of the situation. Each of the types of procurement has conditions that must be met for a procurement to qualify for any of the categories. There have been reports of abuse of the Procurement Act resulting in huge losses to the government

(<https://www.pulse.com.gh/ece-frontpage/sole-sourcing-ghana-loses-dollar2bn-in-sole-sourced-contracts-danquah-institute/m626fpb>). Largely the abuse has been in

connection with single-source procurement where the procurement entity does not have to go through the rigorous process of competitive tendering. The Act allows for single-sourced procurement under specified conditions and some of the conditions are urgency, specialised service and a few other instances. The Act also requires that this type of procurement should be used only in exceptional cases and should not become the norm. There is therefore some discretion allowed the entity as to which type of procurement is used and this is open to abuse by officials.

The quality of equipment one uses in radiography has a direct impact on the diagnostic quality of radiographs that are produced. Some study participants argued that the decision on which type of equipment to purchase and the actual purchasing is often done for the government facilities by the Ministry of Health (MoH). They further argued that ideally, the persons involved in the process leading to the decision making and purchasing of this equipment should have the requisite technical and professional expertise to ensure the equipment purchased is fit for purpose as enshrined in the Procurement Act.

However, it was argued that this not always the case in Ghana. Whilst none of the participants was willing to state categorically whether decisions were based on corruption, they were explicit, politicians who make the decisions could have a personal interest. Across professions and sites, concern was raised about the fact that it may be impacting on the flow and quality of work. One radiologist contended that politicians cannot be challenged and even though ideally the experts should be consulted, if the government decides otherwise, there is little that can be done:

*I don't have anything to say about that one. Because the person who owns the thing, the government, says I want to purchase this, who can challenge the politician? Do you understand, if they say they want your input they will come for your input but if they say they don't want your input what can you do? But the best is to come for your input, normally they don't do that, I don't know probably somebody has an interest in somewhere but what else can you do. It is wrong, I am against it but that is the system we live in (interview PA8, page 7).*

*It was observed that the participant was hesitant in talking about politicians and the role they play in acquisition of equipment; he appeared to be scared of possible victimisation. As is evident from his response, he initially said he had nothing to say about the role politicians play in the purchase of equipment. He appeared to be holding back to much more information. **Reflections of researcher.***

One medical officer argued that sometimes the experts are consulted 'on paper' but their expert advice is often discounted. He further argued that the situation is most likely influenced by personal gain rather than anything else:

*In the ideal situation, consulting the technical people is the best but yes, the situation that I have seen, you consult the technical person, put all the big nice English and documentation on paper but when the machine comes you realize that someone went to buy what they wanted to make money out of personally (Interview PT2 Page 5).*

Some participants argued that corruption and 'kickback' has often led to sub-standard equipment or equipment not fit for purpose being purchased. They point to a lack of strong monitoring of the type of equipment that has been recommended for purchase and the ones that are eventually purchased. The lack of effective monitoring has also been attributed to corruption in that often the specifications for the equipment recommended for purchase by the experts are higher than that eventually purchased. They argued that if monitoring was effective and the final equipment delivered was compared with what the experts recommended, the difference would be detected and remedial actions taken. One medical officer contended that the issue of corruption is widely known and this could be the reason for purchasing equipment that is not fit for purpose or not exactly what was recommended by the experts:

*Many a time it also comes with the authorities or administrative problems where people will quote a figure and purchase something else because of kickback, we all know about corruption and things like that,*



*but the major thing is funding and monitoring. I don't know how they govern it or the facility just buys it or if there is anybody inspecting it or giving clearance to the machine in the first place (interview, PT2 page 6).*

Furthermore, a radiographer in policy formulation and administration argued, the fact that equipment purchases are centralised at the MoH and not actioned at the facility level is another reason which could lead to equipment purchased not being fit for purpose. He added that there is a tendency to assume that all facilities will need the same type of equipment especially because the decisions on the specifications of the equipment to be purchased are not made at the local facility level.

*It is what is expected, in many places in our Ghanaian setting; a lot of times governments or agencies procure equipment on behalf of the facility, in which case the personnel within the facility don't have a lot of say either intentionally or unintentionally. Sometimes equipment's are purchased without the knowledge of radiographers (Interview PA3 Page 2)*

Moreover, a document inviting stakeholders to a meeting in order to address issues of radiographer shortage goes to the core of the central nature of equipment purchases. Stakeholders were invited to a meeting to find solutions to a situation where X-ray equipment had been installed with no radiographers in place to operate it. The opening paragraph of the document read:

*Ministry of Health, Ghana Health Service and the Dutch Government through ORIO have installed X-ray machines in forty-eight hospitals across the country. Unfortunately, most of these X-ray machines are not used because there are no Radiographers to operate them. These unused X-ray machines are in addition to some X-ray machines which were installed earlier under different projects.(GHS Document)*

This document is an indication that the stakeholders were not part of the planning process leading to the acquisition and installation of the equipment. The consultative meeting was called only after the equipment had been installed and personnel were not available to operate it. If the acquisition of equipment had involved the relevant stakeholders, preparations would most likely have been made for qualified personnel to be deployed to the various sites where the equipment was to be installed.

One radiologist contended that this lack of expert input or not making use of the input of experts has led to the purchasing of inappropriate equipment for the particular needs of a developing country like Ghana. Ideally, for a country that has competing needs for resources, one would expect that decisions would be made to ensure judicious use of scarce resources but that does not appear to be the case with equipment procurement in Ghana. There are three Magnetic Resonance Imaging (MRI) machines across the country that are not functioning because they have run out of helium and the facilities are not in a position to buy helium to power the equipment. This is indicative of how expert opinion is not always used in decision making.

*There are a lot of them like that, Kumasi is like that, Cape Coast is like that, and Tamale too is like that. Those ones they have a peculiar*

*problem. Now the question is, the MRI for instance we have types, do you use the permanent magnets or the superconductors? Somebody once made a challenge that in developing countries, we should all get permanent magnets, nothing like Helium or something, so that the machine will be working round the clock. (Interview with PA8 page 8).*

*It was observed that the MRI machine in one of the sites was not functional, upon further enquiries I was told it had run out of helium.*

*When I enquired how long the machine has been down without helium I was told it was a little over a year. (Observation notes)*

Moreover, some participants argued that important considerations such as the availability of experts, for example engineers, who can maintain the machines within the jurisdiction, the capacity of the equipment given the patient throughput of the facility, the availability of spare parts and accessories and any previous history of the brand are often not factored into the decision making process for purchasing of equipment. Either they do not know what should be factored into the decision-making process, or this is just ignored for some other unknown reason. A radiographer in policy formulation and administration reiterates the importance of considering the availability of experts such as engineers to service the equipment and the availability of accessories and parts in deciding which equipment to purchase:

*You think about the availability of experts like engineers within that setting, so if maybe for example I am going in for a Philips equipment, I will sit back and say do we have any experience with Philips, are we aware of their level of expertise, do they have accessories and backups,*

*so these are some the things we do, so if you don't seek to analyse these things and you go and buy or somebody imposes an equipment on you, who has very little experience of the items enumerated, then you are bound to face problems (Interview PA3 Page 2).*

One radiographer contends that the lack of expert input sometimes results in the poor positioning of installed equipment within the examination room thereby inhibiting how it can be used effectively. The positioning itself gives an indication of whether an expert was involved in the installation or not:

*Most of the equipment that are installed have technical limitations because of the installation considerations. For instance, this one here, the chest distance is restricted by the bucky table (interview with PW1 page 3).*

Some participants argued that ideally, equipment servicing and maintenance should be linked to the purchasing agreement for the equipment but that has not been the case with most of the equipment in government facilities. Therefore, when equipment breaks down there is usually a lengthy delay before it is repaired. The suppliers are not bound by a service contract with the facilities so they respond to calls at their convenience, there is no contract that stipulates the time limit within which they should respond to calls. Mostly, the engineers will examine the equipment to determine what the fault is and if it requires the replacement of a part, then the hospital will have to raise the resources to import the part and replace it. This often takes time, as the parts have to be ordered and shipped or air freighted to the country before it can be fixed. This results in long periods

where the equipment is not functioning. It happens primarily because the importance of service contracts is not recognised by the purchasing agency.

*The challenge of the public sector is that one of the problems that they raise is that the service agreement is so expensive that even the work that they do is not even enough to pay for the service contract, so most of them either they don't have the service running or their service has expired. So when there is a problem, then the machine is going to be down for a long time (interview with PA8 page 7).*

A participant argued that the long periods when the equipment is not in clinical use whilst it is waiting to be repaired led in some instances to patients being referred to nearby towns for radiology services. Patients with suspected fractures then had to be transported to surrounding towns for radiology services and brought back to the hospital. This involves travelling for up to an hour on roads that are often in poor condition. This hampers healthcare delivery and worsens the condition of patients, especially those with fractures. She also added that the frequent breakdown of equipment was due to the heavy workload. This raises questions of decision making on the type of equipment to purchase for the hospital and whether the anticipated patient throughput was taken into consideration. Were the experts consulted or it was a 'one size fits all' decision that was taken in acquiring machines of the same capacity for all hospitals, without taking into account their particular needs? A medical officer in a rural hospital expresses her frustrations:

*We had only one machine which was breaking down frequently because of the pressure so we turn to send patients to (Place name) to take X-ray*

*and come back. Sometimes patients who have fractures but will have to move all the way to (Place name) up and down and come back for a decision to be taken on what to do (interview with PW3 page 2)*

Interestingly, the MoH has a biomedical engineering unit which is supposed to offer technical advice on the acquisition and maintenance of equipment. An official of the unit argued that even though they have the capacity to offer expert advice to the MoH, the unit is rarely consulted when equipment is being purchased. He further contended that in the instances where they are consulted; their expert input is not usually heeded.

*The politics in equipment purchases is just unbelievable. Most of the time our input is not sought but in a few instances we are invited to make inputs and we will spend time and energy to make our input only for us to realise that it was not used when the equipment's arrive for installation. It almost seems like that is the money bag for the politicians. (Interview PA10 page) 2)*

### 5.3 Staffing shortage, workload and discriminatory practices

It was observed that staffing levels across all three sites were inadequate. The problem was most acute in the regions, though even in the capital city the numbers were inadequate relative to the workload. (Field notes)

One radiographer argued that if the nation's premier teaching hospital has a shortage of radiographers, it is likely to be indicative of the situation across the country:

*If korle bu has been short of radiographers for the past 5 years, it should give you an indication of what the situation in the country is like. Korle*

*bu has informed management of the staff needs for the past 5 years but they still have a shortage (interview with PA3 page 4)*

*There are radiographers who have refused to work for the government sector because they argue the private sector offers them better salaries and conditions of service. It is therefore possible that the shortage of radiographers in the government hospitals does not really mean there is a short supply of radiographers but because they are electing to work in private facilities. Reflections of researcher*

Some participants argued that fewer hands have to attend to a relatively large number of patients and this can lead to personnel being stressed and mistakes being made. An increasing workload means longer patient waiting time, which also results in longer working hours for radiographers:

*There were just three radiographers here, one is on leave one has been transferred and it is left with just one. The pressure is on him, so he sends some of the patient's home to come the next day. I think the human resource over there still needs improvement (interview with PW3 page 3).*

*It was observed the Ghana Health Service offers motivation and incentive packages to get medical officers to accept posting to deprived or rural areas in the country but the same is not done for other healthcare professionals. (Reflections of researcher)*

Two documents are used to show how differently the GHS responded to shortages of medical officers and radiographers. The first document is from the Director General of the GHS addressed to all Regional Directors and dated July, 2017, it is entitled 'Alternative arrangements to address the lack of qualified radiographers to operate X-ray equipment' under the 'Accelerating tuberculosis detection in Ghana project'. The Director General raises the issue of X-ray machines being installed but with no qualified radiographers to operate them and is seeking to implement measures he describes as temporary to address the shortfall. He indicates that a waiver had been sought and granted by the Nuclear Regulatory Authority to train individuals to operate the X-ray machines. The document outlines the interim arrangements to be implemented as follows:

*Each region should group the hospitals with X-ray equipment into zones*

*Appoint a qualified licensed Radiographer for each zone to supervise and manage the operation of the X-ray equipment within their jurisdiction*

*The appointed qualified licensed Radiographers shall act as Radiation Safety officers for the hospitals assigned to them.*

*The hospitals with X-ray equipment but have no licensed Radiographers shall engage unlicensed Radiographers on temporary appointment*

*The region should forward all the names, contact information and the CVs of the appointed staff to my office for further action.*

The second document dated April 2018 and entitled 'Attracting and retaining medical officers in western region' indicates the measures put in place to address the shortage of



medical officers in a deprived or rural area. The document is addressed to all District Directors of health services and all medical superintendents to remind them of actions that should be taken to attract and retain medical officers within the region. The document states in part:

*Apart from decent accommodation furnished with soft furniture and satellite TV, we would want the Medical Officers to be supported with fuel and per diem to attend the following activities every month.*

*Continuous Professional Development (CPD)*

*Public Health workshops*

*Monthly meetings with Regional Director of Health Service (RDHS)*

*Ghana Medical Association (GMA) Meetings*

*Other activities in the Region or Hospital.*

*And occasional transport support to see family if they are not together.*

*In addition to the above, each Medical Officer will be sponsored for further studies when he/she decides to go for specialisation.*

It is obvious from these two documents that medical officers were offered incentives to attract qualified personnel to the rural areas, whereas the GHS was willing to break the law by engaging the services of unlicensed radiographers and thereby exposing patients to danger. It is also interesting to note that the persons referred to as unlicensed radiographers are indeed not radiographers at all and have not had any formal education

in radiography. These persons were supposed to be selected by hospital management from any background whatsoever they deemed fit.

*Radiographs should normally be accompanied with a report interpreting the findings on the radiograph; this is often not the case in the sites this study covered. Mainly because one of the sites neither had a resident nor visiting radiologist, one had a single radiologist and the third site, even though had majority of the radiologists in Ghana, they were still overwhelmed with the amount of work. This situation had therefore led to most radiographs not reported; the few that are reported are not reported on time and takes from a couple of days to weeks to be ready mainly due to the radiologists' shortage and the resulting workload.*

***(Field notes)***

Some participants argued that there are times when patients either die or are discharged from hospital before the reports are ready. This clearly impacts negatively on the quality of radiological services and, by extension, healthcare services accessed. The delay is seen mainly to be due to the radiologists' shortage and resulting workload:

*Patients do not get their reports early, means that doctors just have to continue with whatever treatment plan and sometimes some of the patients even pass on before the reports are ready. So probably the early intervention by issuing the report could have possibly saved a life, but because of delay some of these things occur. There are many reports*

*laying in the department, patients never return to pick them up because of some of these things (interview with PT3 page 3)*

Most participants argued that in every profession, the ability to progress and specialise in an area in order to become a master or specialist serves as motivation. However radiography in Ghana does not currently offer that possibility. This limits the ability of radiographers to explore any one particular sub-specialty in order to gain more insight into that area and thus help with patient care. The abilities and contribution of the radiographers are spread so widely and thinly that they may have an insight into every modality but cannot be said to have in-depth knowledge of any one particular area. There are no local programmes for radiographers to enable them to specialise and there are no sponsorships or scholarships for radiographers interested in undertaking such studies abroad. This situation has therefore led to some radiographers leaving the profession thereby further compounding the workload. Radiographers in Ghana are expected to be a 'jack of all trades' and that is a challenge because one does not get the opportunity to specialise:

*We are also challenged in specialisation, as a radiographer you are supposed to be an all-rounder, from basic general radiography, to fluoroscopy, CT scan and MRI. We do not have the comfort of specialising in maybe just CT, I am just a CT radiographer or an MRI radiographer, you should be an all-rounder, and it is a challenge. Therefore, we do not have the leeway to specialise and have in-depth knowledge in a particular modality, maybe it is coming from sponsorship*

*for further programmes in this specialisation or maybe unavailability of the modalities (interview with PA3 page 3).*

#### 5.4 Shortage of consumables, lack of basic facilities and services

Consumables and basic facilities are essential for the smooth flow of work. Most participants contend that the availability of consumables at all times is not guaranteed in the sites where this study was conducted. In some cases, very basic consumables such as gloves and methylated spirit, amongst others, are in short supply at times. Participants argued that this impedes the smooth flow of work:

*Shortage of supplies like the X-ray films, sometimes envelopes to even put the films in for patients is a problem and the usual consumables like gloves, methylated spirit, cotton wool and the rest to make the work flow smoothly. When they are not available, it impedes the flow of work (interview with PT3 page 2).*

*In addition, during an observation in a rural hospital, the hospital had run out of X-ray films. The images had to be put on a tablet and sent to the requesting physician to examine and then it is brought back for the radiograph of the next patient to be loaded and the whole process repeated. There were no facilities provided for the requesting physician to have access to the radiographs in either their consulting rooms or the wards. The requesting physician in some instances had to view the radiographs on the computer monitor in the radiology department. This caused a lot of inconvenience for physicians from various consulting*

*rooms and wards. Another challenge faced by the physicians was at what point does he or she go to view the radiographs? Wait to consult all patients or go there after each patient requiring a radiograph? Either option posed a challenge to either the physician or the patient. The radiographer also had to interrupt work anytime a physician comes in to view a radiograph. This was to allow the physician access to the monitor, which most often is used by the radiographer to input the details of the patient and the examination to be done. This is a significant challenge for effective and safe practice.*

*(Reflections of researcher)*

One participant complained about a challenge they were currently facing, their printer had broken down so they were unable to print radiographs. The requesting physicians had to view the images at the radiology department as the hospital does not have a picture archiving and communication system (PACS) in place:

*Even now with the digital, they are still having their problems with the logistics, for instance, the digital we have now, and the printer is out of service so if it is not by electronic images, we cannot view them, but they were supposed to have hard copies through printing. So those are the radiological challenges we have (Interview PW1 Page4).*

Some participants intimated that basic facilities to aid the flow of work were not always available, this led to physicians having to improvise in order to provide the needed care to their patients. Similar cases were reported across all the sites taking part in this study

and in all cases it affected the quality of care they were able to offer to the patients. A medical officer recounted an instance where he needed a gynaecological set to use in examining a patient with a suspected ectopic pregnancy; the facility did not have the set. Instances such as these affect the service that can be offered to the patient by the physician:

*I have a patient with an ectopic pregnancy, I want to do a speculum examination, to see if I could do a culdocentesis, they tell me we don't have a gynaecological set for that examination, it is only when the gynaecologist comes that he brings his own set. When that happens, you are unable to help, that diagnosis alone if you are able to make and picking it up early, you can refer this case of ectopic for urgent surgery so that you do not lose the patient, but this delay affects patient care in the end (interview with PA7 page 2)*

Most participants argued that some of the facilities are so basic that even the most deprived of facilities should have them if the quality of care patients are offered at these hospitals is of prime importance to the management of the hospital and the GHS. The lack of these very basic facilities frustrates the personnel in carrying out their professional duties. A medical officer argued that the lack of basic patient management kit leads to late diagnosis and sometimes preventable deaths:

*We understand we are in a deprived area but even getting the basic patient management is almost non-existent because these challenges are real. I mean simple diagnostic techniques are non-existent. We have*

*to make do with improvisations that does not give us the best diagnosis and sometimes-late diagnosis that end up harming the patient or even the death of the patient (interview PT2 page 1).*

*All personnel working in radiation are supposed to be monitored for doses of radiation they might have absorbed in the cause of work, this is done to ensure the absorbed dose is within the internationally acceptable dose limits and if not then the necessary action would be taken. If personnel are found to have exceeded the internationally accepted dose limits, immediate investigations are instituted to determine what the cause could be. The investigations will seek to determine if the affected personnel are observing all the safety practices of radiation protection, if the equipment used are safe for practice or not, if there is radiation leakage at any point or if any of the tools or equipment used for radiation protection are working optimally. At the time of the study, all radiation workers in the country had not been monitored for four months, because the equipment used by the monitoring body, the Radiation Protection Institute (RPI) of the Ghana Atomic Energy Commission (GAEC) had broken down and could not be repaired. The implications could be dire. If there is a radiation leakage and the personnel are absorbing radiation well above the recommended acceptable dose limits, there is no way of detecting it and this would have effects on the health and wellbeing of the personnel. The Ghana Society of Radiographers, even though had written some letters*

*requesting for alternative service provide for radiation monitoring services, was not seen to be forceful about it. (Reflections of researcher)*

One radiographer argued that it was demotivating to be working without being monitored for radiation doses absorbed and not even knowing when monitoring will resume:

*Even radiation monitoring, we are not being monitored, Ghana Atomic Energy Commission (GAEC) for the past 4 months they say their machines have broken down. So, no Ghanaian radiographer is being monitored for now, it is a demotivation, no radiation worker should work without being monitored, GAEC and Radiation Protection Institute (RPI), they have the sole responsibility to monitor us, their equipment is broken down for the past 4 months, they are trying to acquire one (interview with PA3 page 9).*

A document from the Radiation Protection Institute (RPI) of the Ghana Atomic Energy Commission (GAEC) dated April, 2018 and entitled 'Re: Radiation dose monitoring of radiographer' in response to an enquiry from the GSR indicated that the institute had suspended personal monitoring services because the equipment used in reading thermo luminescent dosimeters (TLD) was faulty. The document added that they were working to resolve it and once that had been done, the GSR would be notified. The document states in part:

*Please to inform you that our personal monitoring services have been temporarily suspended due to a technical challenge with our TLD reader system, which is rapidly being resolved (Document).*



In addition, another document that relates to the issues of radiation monitoring from the Nuclear Regulatory Authority (NRA) addressed to the GSR listed a number of companies that have been accredited by the NRA to provide radiation-monitoring services in Ghana. This service hitherto was done solely by the Radiation Protection Institute (RPI) of the GAEC. Therefore, the GSR was not aware of the companies that had been accredited to perform dosimetry. The document in part states:

*We acknowledge receipt of your letter (reference letter) requesting the Nuclear Regulatory Authority (NRA) to furnish you with the list of institutions accredited by the NRA to provide dosimetry services in Ghana. Kindly find below the requested list and the type of device they provide.*

Furthermore, some participants argued that when monitoring was being undertaken, there were still challenges because the reports from the monitoring were not made available to the personnel. In most cases, personnel are not shown the results, the results were sent to the management of the hospital by the RPI. However, the management does not disclose its contents to the individual personnel involved. Personnel were not allowed access to their results without the prior approval of the head of department. One radiographer argued that the practice of practitioners not being given their results from previous monitoring is prevalent:

*I mean we are radiation workers we need to be monitored. Thermo Luminescent dosimeter (TLDs) are given to you and you wear it over three months and over a year and nobody comes for it to send to the*

*appropriate body to be read and even if they are read, results are not given to you to know the dose that you have received within a particular period. Usually the results are left at the management level and it is difficult tracing to find out some of these results as an individual (interview with PT4 page 2).*

## 5.5 Regulatory challenges

The Allied Health Professions Council (AHPC) is a body set up by law to regulate the standards of training and practice of allied health professions in Ghana. The law setting up the AHPC is Act 857 2013.

A senior official from the AHPC contends that the council is challenged because prior to it being set up, the practice of the allied health professions was unregulated for many years. There was therefore a need to create public awareness and sensitivity to the fact that it was mandatory for all allied health professionals to register with the AHPC to enable them to practice. The raising of public awareness was followed by registration of all health professionals that met the basic requirements for registration. This was a very difficult task mainly because allied health professionals had never been required to register for a license as a condition to practice. He further argued that this lack of regulation over the years is posing a challenge to regulation as the level of awareness remains very low:

*Allied health professionals were left unregulated for several decades, so emmm the challenge now is because the professions were left unregulated for several years, now that the regulative framework is in place the awareness level is low and compliance is also low so what we*

*are doing now is to try and create awareness and also enforce some of the provisions of the ACT (interview with PA9 page 1)*

Additionally, the council is responsible for regulating eighteen different professions which are spread throughout the country. The council requires considerable logistical support and resources to effectively regulate these professions, and it will need to establish a presence across the country to be able to combat the problem of unqualified and unregistered personnel practising. The required resources are not immediately available in a developing country like Ghana. A senior official of the AHPC argued that the council is faced with logistical constraints that are affecting its ability to fulfil its mandate:

*As a new agency under the MoH one of the challenges that we face is logistics and resources to be able to undertake the huge mandate that the council is entrusted with. Currently the council is regulating 18 different professions, so unlike pharmacy council or nurses and midwifery councils that are regulating mono-professions the AHPC is regulating 18 different professions so there is a huge responsibility in the way of the council (interview with PA9 page 1).*

He further contends that the current structure of the council is such that it does not have either zonal or regional offices, this situation therefore requires all persons who transact any form of business with the council to travel to the capital city Accra regardless of their location. He added that the process of registration although it can be started online must be completed in person at the council's offices in Accra. This is serving as a disincentive for people as they have to travel from their base to Accra in order to renew their

registration. He argued that this is one of the major challenges faced by the council in trying to ensure that registration is brought to the doorstep of the various professionals:

*The AHPC like I said regulates several professions who are spread across the length and breadth of the country, one of the things that we are trying to do with support from the ministry is to have zonal offices so we can bring our activities closer to the people across the length and breadth of the country. So that people from Tumu, people from Sefwi wiawso, people from Sandema may not necessarily have to travel to Accra for some of the activities of the council (interview with PA9 page 2).*

These regulatory challenges will have to be addressed if the fledgling AHPC is to stand any chance of success, particularly as it is the largest and yet most under-resourced of all the regulatory bodies.

*Some of the challenges faced by the regulatory body are from the managers of various facilities both government and privately owned. The private facilities employ unqualified and unregistered personnel to operate their facilities because it is cheaper to engage the services of these unqualified persons compared to employing qualified personnel. The government facilities on the other hand engage the services of these unqualified persons because they are not unionised and as such when the qualified persons embark on strike for one reason or the other, these unqualified persons are made to work in place of the striking qualified*

*personnel. This practice comes with the dangers of using unqualified persons. It is also surprising that the council does not seem to be keen on using technology to make the registration and renewal easier for the professionals they regulate. It is interesting that even though it is cheaper to digitize registration and renewal of licenses than it is to operate regional and zonal offices, the council is more interested in the later. (Reflections of researcher)*

A letter from the AHPC addressed to the Minister of Health raised the issue of unqualified people being engaged by Medical Superintendents and Directors in some parts of the country because medical laboratory scientists had embarked on strike action. It also addressed the fact that managers of some government facilities engage the services of unqualified and unregistered people to work in areas for which they are not qualified. An excerpt from the letter reads:

*'Please I wish to bring to your attention the activities of some Medical Superintendents and Directors who are engaging unqualified people and, in some instances, casual labourers to work in the laboratories in the absence of the striking Medical Laboratory Scientists. Particular mention can be made of (name of place) Government Hospital in the Brong Ahafo Region. These actions are both legally and ethically wrong and should be condemned and halted' (Document)*

The document further stressed the readiness of the AHPC to use legal means to halt any such unlawful activities with the aim of protecting the public from harm by unqualified personnel:

*It is significant to mention that the council will not hesitate to invoke the relevant provisions in Part One, Act 857 of 2013 to halt such an illegality to protect the public (Document).*

In addition, some of the regulatory challenges could be a result of the appointment of people without the requisite qualifications to positions within the regulatory bodies. In Ghana the Health Facilities Regulatory Authority (HeFRA) which is set up by law, Act 829 (2011), regulates facilities providing any form of healthcare services.

A petition signed by three health professionals, addressed to the President of Ghana and copied to the Chairman of the Health Select Committee of Parliament and the Minister of Health, argued that the registrar of the HeFRA is not qualified to occupy that position. They contend that his continuous stay in that position will affect the effectiveness of the authority. They further argued that the registrar is not a health professional and that will affect his ability to function, given the duties that the authority is supposed to perform.

The petition states in part:

*The functions of HeFRA as outlined by the Health Institutions and Facilities Act 829 (2011) part 1 section 4 is to “receive, consider and approve applications for licences, inspect and license facilities intended for the provision of public and private health care services”. It is also to “regulate and monitor activities in a practice to determine the adequacy and standards of healthcare provided; collaborate with any other person or authority to maintain professional standards in a practice.*

*Per section 100 of the Health Institutions and Facilities Act 829 (2011),*

*“The Registrar shall be a practitioner with considerable administrative and managerial experience or training” (Document).*

The petitioners therefore argued that the registrar would not be able to perform the functions listed above because he is not a health practitioner and will not understand how facilities should work. They further argued that the law setting up the authority specifically gives the criteria that must be met by the registrar, one of the conditions being that the registrar must be a practitioner which the current registrar is not.

Another document from the Ghana Health Service which seeks to address a shortage of radiographers in Ghana temporarily (as discussed earlier in this chapter) is requesting that its directors engage the services of unlicensed and unqualified personnel to operate X-ray machines in hospitals that do not have radiographers, this is in clear violation of the law. This kind of action, coming from a government agency that should be implementing government policy, is worrying and professionally unacceptable.

## 5.6 Challenges in Professional Practice Accounting for the need to introduce Role

### Extension in diagnostic radiography in Ghana

The previous section provided evidence of the challenges that radiographers, radiologists and medical officers in Ghana, practising at the three sites of the study, encounter in their line of duty. It explored how the various challenges encountered in their practise impact negatively on the performance of their duties and quality of care to the patients. Ideally, the basic tools, appliances and consumables needed to facilitate work should be available for the use of the healthcare professionals, but that is not always the case in Ghana. This therefore affected the free flow of work and the quality of healthcare delivered to the

patients. Nevertheless, the data suggests that these professionals improvised in most cases in an attempt to deliver the best possible service to their patients under the circumstances.

This second part of the chapter explores the challenges to professional practice that serve as factors for the need to introduce role extension in diagnostic radiography in Ghana. The shortage of radiologists in the country, which is further compounded by the skewed distribution of the few that are available. The professional ambitions of radiographers for role extension and the support role extension enjoys from radiographers, radiologists and medical officers across all the sites of the study. These factors will be explored to make a strong case for the introduction of role extension in diagnostic radiography in Ghana.

#### 5.6.1 Shortage of Radiologists

*It was observed that the shortage of radiologists was a very prominent challenge identified across all three sites. This challenge has also been identified as a very important factor for the need to introduce role extension in diagnostic radiography in Ghana. It was observed that due to a shortage of radiologists in Ghana, radiographs are unreported and even the few that get reported take a rather long period to be ready. In some instances, the reports come in rather late. Medical officers have been “forced” to proceed with treatment without a radiologist’s report on the radiographs. (Reflections of researcher)*

One participant contends that Ghana, with a population of about 27 million, has a radiologist population of approximately forty. This number is woefully inadequate to cater for the health needs of the population. The situation has therefore led to delays in



producing radiologists' reports and in most cases, radiographs are not reported on. He therefore argues that the shortage of radiologists brings to the fore the need to introduce role extension in diagnostic radiography in Ghana. He further argues that role extension has the potential to ensure that most radiographs are reported and that the waiting time for radiologists' reports is reduced:

*Yes, there is a huge need for role extension in Ghana. Currently, they are conservatively about 27 million Ghanaians, of which we have about 300 radiographers attending to them, that means 1 radiographer attends to 90,000 Ghanaians, the proportion is even worse for radiologists, if am not mistaking and I am being a bit generous, about 40 radiologists in Ghana attending to the same 27 million Ghanaians. That means radiographers who are even more than radiologist are to take on more roles the waiting times of patients will be reduced. That will improve reaction time and treatment time for patients and that will reduce the stress levels of radiologists. So generally, that is the main importance for pushing for role extension in Ghana (Interview PA5 page 5).*

Some participants argued that the shortage of radiologists leads to the pressure of work being handled by few radiologists. The pressure resulting from increased workload could lead to stress and possible mistakes. A radiologist outlines how he is able to manage the increased workload resulting from a shortage of radiologists. He leaves radiographs from his facility to attend to those from other towns and hospitals, so they can go back to the requesting physicians to be attended to:

*I have found a way of dealing with in house jobs, then the out cases, those cases are coming from the other regions and other hospitals, and they are usually not too many of it at a time. Therefore, when they come, I relinquish in house jobs and maybe postpone that one for a day or two and do the outskirts, so they can go back. So that is how I manage it. Sometimes it becomes overwhelming, they stay here and I ask them take the patient back and one of you will stay and take the report along or you go and I talk to the doctor immediately so that he can do something whilst I send him a report (interview PT1 page 3).*

Most participants argued that the pressure of work increases the time taken to produce reports and this then results in physicians having to wait longer before they can continue with further management of their patient. They argued that most of the radiographs are not reported on even when radiologists are available, this is due to the volume of work. Some of the areas without radiologists like the Upper West and East regions send some of their radiographs to the nearest radiologists at the Tamale Teaching Hospital for reports, this therefore prolongs the time it takes to get them and means an increased workload for the radiologists at Tamale.

Some reasons have been assigned by participants for the shortage of radiologists in Ghana and these are discussed under the following headings, **training of radiologists**, **skewed distribution**, and **multiple tasks taken up by the few radiologists**.

### 5.6.1.1 Training of Radiologists

Some participants argued that the training of radiologists was previously done at the West African College of Physicians and Surgeons, this limited the number of residents from each country that could be accepted each year. This meant that the number of radiologists trained each year was restricted by the limited capacity of the college and also because the college was training specialists for the whole of the West African sub-region which is comprised of sixteen countries. One radiologist contends that the introduction of the Ghana College of Physicians and Surgeons has increased the number of radiologists trained annually:

*Oh, now the numbers have improved significantly, the numbers have improved significantly, eh when we were training there was only one body, it was the West African programme. It was later before we started another programme, the local programme, the Ghana college programme. So now we have the West Africa college programme and the Ghana college programme. They are all turning out radiologists so the numbers of late has multiplied than previously (interview PA8 page 3).*

However, he explained that although the number of radiologists has increased significantly over the years, the workload has also increased rather than reducing. He argued that this is the case because the level of awareness of radiology has increased and many physicians are now making requests for conditions that hitherto they would not. This is therefore resulting in a shortage of radiologists because the workload is overwhelming for the radiologists available:

*The workload has rather increased, hahahahahaha, the workload is rather increasing because people have now come to realise that there is a field called radiology and now, and they are beginning to understand the radiology aspect. So, everybody after examining their patients clinically, they want some imaging so they write it for you, so the work has increased tremendously over time (interview PA8 page 3).*

Participants further argued that the increase in numbers is still woefully inadequate for the country and various reasons have been assigned for this situation. Lack of sponsorship for the radiologists' programme, the duration of the programme compared to other residency programmes, the programme being a very difficult one, and general lack of interest are some of the reasons given for the low numbers of medical officers who enrol in the radiology residency programme. One radiographer in a rural hospital opines:

*From what I heard from some of the house officers they feel it is difficult specializing in radiology and the number of years as well is extended than other specialties (interview PT4 page 5).*

#### **5.6.1.2 Skewed distribution of Radiologists**

*It was observed that the shortage of radiologists is further compounded by a skewed distribution with majority of the radiologists being in the two big cities in Ghana Accra and Kumasi. There are two regional hospitals without a single radiologist, four regional hospitals with one radiologist each. This skewness in the distribution of radiologists in Ghana has been attributed to various reasons. These reasons include, an*

*argument that the other regions apart from Accra and Kumasi are not attractive enough for radiologists to want to work there. This is because there are no opportunities of making additional income apart from their salaries. In Accra and Kumasi, the radiologists are able to take on additional work from private establishments and hospitals after close of work to earn additional resources. Radiologists taking up second jobs which they call locum is possible because there is a shortage of radiologists and the demand for the services of radiologists far exceeds supply even in the big cities where majority of the radiologists are stationed. (Reflections of researcher)*

One radiologist argued that the inability of radiologists practising in the rural areas to earn additional income, due to the volume of work in the rural areas, serves as a factor that has contributed greatly to the skewed distribution of radiologists in Ghana. Even though these rural areas are without private radiologist services, the workload in the hospital is overwhelming and therefore makes it impossible to take on additional work outside of the government hospital:

*The reasons are people want to do extra work and make extra money or earn additional income. The periphery when you go you don't have that benefit and it is also difficult for you as one person to deal with the hospitals work and at the end of the day have private work outside that, it becomes difficult so even if it was as it were a virgin area for private establishment you cannot do that because unless you decide to just step out of public sector and do your private practice and that is where the*

*difficulty is so people don't want to come here to the periphery because when they come they won't get the additional income that they expect (Interview PT1 page 5).*

One radiographer argued that, another financial reason that makes the rural areas less attractive is that the reporting fee (money paid for image interpretation) is very low in the other regions compared to Accra and Kumasi, this is mainly because the economic power of the people outside Accra and Kumasi is generally lower. These fees paid for image interpretation are meant for the radiologists. The lower the fee the smaller the amount of money that the radiologist gets. This therefore serves as a disincentive for radiologists to accept work outside of Accra and Kumasi.

*Their salaries are the same, but you know they have a fee attached to every report that they produce but over here the fee attached is small. They think the economic strength of the people is low, so the fee attached to every report is usually low as compared to the radiologists down south (interview with PT4 page 4).*

Furthermore, participants argued that these radiologists would have started families in the area where they are practising currently and having to move to a new place will require keeping two homes. They might not be able to get schools of the same standard, as they have in Accra, for their children. They further argued that in most instances the jobs of their spouses might not have branches in these other regions. Jobs are difficult to get in a developing country like Ghana; it is therefore unlikely that the spouse would leave their job in the city to relocate with their partner when there is no guarantee that they

would find another job. The radiologists would then have to run two homes if he or she were to accept work outside of their current station, be it Accra or Kumasi:

*The person has already started his family and lives with the wife in the city, the children are attending schools in the city, if this person moves to the hinterlands he is going to run two homes, which will cost him a lot of money (Interview with PA2 page 3.)*

*Again, it was observed that due to the skewed distribution of radiologists, some facilities have one resident radiologists. Such facilities still have to deal with the shortage of radiologists in that when the single radiologist is either taken ill, travels or is on vacation, the facility will have to work without the services of a radiologists for the whole period that the radiologists is away. (Field notes)*

Furthermore, participants point to the distribution or availability of equipment for the various modalities as a challenge to practice that is undertaken outside the capital city. Most facilities have only general-purpose radiography equipment and an ultrasound unit. They do not normally have cross sectional imaging modalities like computed tomography (CT) scan and Magnetic Resonance Imaging (MRI) units. This situation has led to a heavy workload in places with these modalities. One radiologist in a rural hospital contends that patients requiring the services of a CT scan and an MRI anywhere within the Upper West, Upper East and Northern Regions can only receive these services in Tamale:

*Actually northern region this is the only place that we have CT and MRI, including the upper east and west regions and so most of the cases that*

*need either CT or MRI scan they come here because it is easier coming from Wa to Tamale than going from Wa to Accra or Kumasi. The same thing for Bolga or Bawku to Tamale than to Accra or Kumasi (interview with PT1 page 3).*

In addition, some participants argued that one issue that has served as a disincentive to professionals accepting work in areas outside the capital city, has been the limited number of modalities available to them. It has therefore contributed to the skewed distribution of professionals which is evident within the country. Sadly, the absence of such professionals in these facilities affects the quality of healthcare that the clients receive. A radiologist in an urban hospital argued that the reality of having to practice with just general radiography and ultrasound serves as a disincentive to both radiographers and radiologists in accepting work in such facilities. The professionals feel limited by the lack of cross-sectional modalities in these facilities:

*I think also that apart from the market, equipment wise, it is also very important, let's say for the whole of the North, from the Brong Ahafo region to the 3 Northern regions, only one MRI, CT scan only one, do you understand, so everything is down here, so I think equipment wise too is responsible. There have to put all those things in place to attract people to go, because you can't go there and be doing only plain radiography, do you understand, so that is the thing (Interview PA8 Page 3).*

One radiographer in higher education argued that the restriction, resulting from the lack of equipment for these modalities, may lead to the skills acquired for these procedures being lost or the practitioners becoming 'rusty' for lack of practice. Generally, all the



professionals have the desire to be competent in as many modalities as possible, so if they are restricted in the number of modalities available to them then they are unlikely to be attracted to work in these places:

*You have trained students in MRI, he or she has qualified, he is sent to a district hospital and they don't have CT, and they don't have MRI, meanwhile this qualified radiographer is good in these modalities because he has gone through it, so he is limited to only the routine or general cases. With time, they forget about these advanced imaging modalities (interview PA6 page 3).*

#### **5.6.1.3 Multiple tasks taken up by radiologists**

One of the issues raised by the participants was with regard to multiple tasks being undertaken by radiologists, most of which were not directly related to their clinical practice. This expanded scope of practice worsens the already difficult situation existing due to a radiologist shortage in the country. One radiographer argued that these additional tasks are further aggravating the delay in radiologist reports being issued:

*I will say the number of radiologists are very few in the country, the available ones are also taking up multiple assignments, some are in management positions, some are in academia and, so they are already few and the time is being taken by these other engagements that is causing the delay (Interview PA4 Page 3)*

*It was also observed that some radiologists that are attached to particular facilities do have their own clinical practice outside of the*

*facilities where they work. Some of them were seen reporting on radiographs from their private practice during working hours. At least one radiologist was seen at his private facility during normal working hours. Another radiologist intimated he is a visiting radiologist at two other facilities where he sometimes provided services during normal working hours when he should be at post at the facility where he is employed full-time. Some of them have been found to spend hours for which they are paid on their private activities. (Field notes)*

### 5.6.2 Radiographer professional ambition

The need for radiographers to be given the opportunity to specialise in the various sub-specialities, and to expand their roles into other areas currently beyond their scope of practice, was emphasised by radiographer participants. They contended that this was essential because it would help to develop the profession and retain current practitioners as a result of the clear career progression pathway:

*In any profession everyone wants to advance and to advance you should have areas that you can also specialise, you have to add on to your previous roles because the idea that radiographers just produces images in the olden days is past, radiographers have advanced, technology is advancing, new procedures or practices are coming to the profession so for me role extension is now or never (interview PA6 page 3).*

The obvious shortage of radiologists, resulting in large volumes of radiographs going unreported or delayed, is affecting the delivery of healthcare to the client. Participants therefore advocated that radiographers should be given the requisite education to enable them to interpret some of the basic radiographs so that the radiographs left for the radiologist to interpret are fewer or more complex cases. It was further argued that radiographers are capable of taking up these tasks once they have received the appropriate further education:

*Where there are no radiologists and, yet their cases must be reported, this brings in role extension for radiographers. There are certain basic radiographs that can be reported by the radiographers if they are given*

*a further training, from the basic pattern recognition and if they are given a further training and polishing they can take up these roles and perform very creditably (Interview PA3 page 5)*

Some participants contended that almost every hospital with a radiology department has a qualified radiographer. They explained that radiographers have been given some training that now allows them to set a line to inject a contrast agent; a task they are performing excellently. This is one example provided to support the contention that, with education, radiographers are also capable of interpreting radiographs and that this would go a long way towards improving healthcare delivery to clients:

*For Ghana it is very important we have role extension, the problems we are having are many and that when you take the radiography workforce, we are more than the radiologists, at least in every district you will find a radiographer there. We need a radiologist to report the radiographs the radiographer will produce, yet they are very few and not always readily available and we think that when radiographers are able to take on the roles that otherwise others would have done if the numbers were intact, it will go a long way to promote care. In the past, for instance, contrast administration was not our domain but when you are doing a CT scan and you need to set a line, you as the radiographer in-charge, with no other nurse or anyone to support, so now radiographers train on how to set line, how to give contrast. This is improving care and practice so definitely; it is very important that we have role extension (Interview PA4 page 4).*

Agitation by participants (mostly radiographers) for the introduction of role extension in radiography in Ghana was intense. They argued that given the challenges radiology is faced with in the health sector, especially the shortage of radiologists, it will serve the nation well to have a policy that allows radiographers to extend their roles and incorporate some of the roles that are traditionally within the scope of the radiologists. They further argued that to be able to keep pace with professional developments across the world in radiography, role extension should be introduced in Ghana as has already been done internationally. Especially given that the factors that have necessitated the introduction of role extension in these countries are also prevalent in Ghana. Radiographers however insist role extension must be tailored to the local needs of the country for it to be effective.

*We should look at what is needed in our environment first, like I said needs assessment will have to be done and look at the areas that is needed and we divide it and then people will have to specialise in the areas (Interview PA4 page 4).*

#### **5.6.2.1 Professional Recognition**

Professional recognition has been cited by participants as one of the reasons that radiographers are agitating for the introduction of role extension. They argued that role extension will result in them being directly involved in the management of patients which is a sign of professional autonomy. They further argued that currently, they are made to feel as though they are 'photographers' whose only duty is to get the 'photograph' taken and that they have no other role to play. They also contend that the physicians and nurses do not give them the opportunity to have any input beyond producing the radiographs,

so they feel their professional competence is not recognised. They therefore believe that once they are allowed to extend their roles into areas of image interpretation, amongst others, their professional opinion will become highly sought after and recognised:

*They just come do my radiograph for me and I take my thing away and that's all we do. All radiographs are not reported but of course it is actually not ensuring quality of care, even what we know if they will allow us to do that in a certain standard way it will still help. But even that simple thing they won't allow you to do it. The doctor will not allow you to talk, the nurse will not allow you to talk, yours is do radiographs, whatever it is, and you do it for me (interview PW1 page 3).*

Radiographer participants felt that the introduction of role extension in radiography in Ghana would naturally attract more people into the profession. They argued that attributes such as professional autonomy and more involvement in patient pathways will add to the appeal of the profession. Even though the numbers of radiographers are low at present, role extension would attract more people into the profession. There would also be greater retention as the number of radiographers leaving the profession, due to lack of recognition, would be greatly reduced. It was also argued that role extension would engender greater job satisfaction, which should promote retention:

*It is going to really bring job satisfaction. In a sense that we know our job itself is recognised. When you are a radiographer in the future someone might ask you what type of radiographer are you and you won't just mention diagnostic or therapeutic radiographer but you will*

*say I am a specialist radiographer and so on and so forth. So, it gives a broader scope of our field and it will also make anyone that gets into this field know that they have entered a profession that is worthwhile. It will also bring recognition. I think many more people will be attracted to the profession once there is recognition (interview PW2 page 7).*

The need for radiographers to be able to specialise, so that they can develop in-depth knowledge in that particular area or modality thus improving the quality of healthcare the patients receive, has again been highlighted as one of the reasons role extension should be introduced. Radiographer participants argued that when a radiographer specialises in any particular area or modality, it affords them the opportunity to concentrate on that area so they can master it and acquire special skills in order to help improve patient care.

*Areas where role extension works perfectly, it is based on divisions, so we have radiographers who will specifically learn how to report appendicular imaging, so that the person will concentrate on that areas, learn thoroughly in that area and become a competent person who can deliver when he is called upon at his facility especially where there are no radiologists to deliver well (Interview PA4 page 5).*

Some participants contend that there is a precedent in the Ghanaian healthcare system, nurses were given further education and allowed to practice as medical assistants due to a shortage of medical officers, so this would not be a new approach. They therefore argued that, as was done in the case of a shortage of medical officers, the MoH can and should introduce role extension in radiography and allow radiographers to extend their roles to fill the gap created by a shortage of radiologists:

*Previously MoH, we had midwives and radiologists and they realised that midwives could do part of sonography, scanning under obstetrics, so MoH took it up upon itself to now engage in training of midwives to go into that specific area and that is what they did. So of course, with that argument they can also come in here and do the same thing for us. They did it again when there was shortage of doctors, when they started training more medical assistants who were nurses to go into support roles as physician assistants or medical assistants and that is another time that they took that initiative (interview PA5 page 8).*

#### **5.6.2.2 Improve Quality of Care**

Participants argued that the introduction of role extension in Ghana would reduce the time taken for radiological reports to be produced, increase the number of radiographs that are reported and thereby reduce the possibility of radiographs being misinterpreted by medical officers. This will lead to shorter report turnaround times which will assist the medical officer in deciding on the care plan for the patients more quickly. It will also result in more accurate interpretation of images by trained hands rather than medical officers being overburdened by having to interpret images with the limited training they have in this. The overall quality of care the patients receive would be improved because reports would be ready faster and the reports would be more accurate:

*It will make the work of the radiographers and the radiologists easier, the stress level will come down, the workload will be shared amongst us so it will make the quality of work go up because if you are doing 200 people in a day obviously you will get tired from the work and you might*



*be prone to mistakes. So, it makes our work easier, quick return on reports, the patients get the care they need quicker. Instead of waiting two weeks for a report (interview with PA1 page 5).*

In addition, it is argued by participants that if roles were extended and radiographers took up some of the roles of the radiologists, it would reduce their workload and by extension their stress levels. With reduced workload and stress levels, radiologists should typically be able to report with minimal mistakes. Radiologists would also have the time to concentrate on more complex cases, this would make better use of their skills and improve the quality of care to patients. The radiologists would also have enough time to help with training of more residents as their workload would be minimal. Radiologists would have a reduced workload if radiographers extended their roles and this would give them time to take on other responsibilities such as research, this could help improve radiology services generally.

### 5.6.3 Support from Healthcare Professionals

There was considerable support from medical officers, radiographers and radiologists for the introduction of role extension in diagnostic radiography in Ghana. The support from radiographers and medical officers was absolute; however, support from one radiologist was conditional. The supportive healthcare professionals argued that radiographers are widespread across the country and, in most places that have equipment for radiography, there is always at least a radiographer who can be relied upon to help with image interpretation. They therefore argued that if there was a policy that formalises this practice and offers radiographers further education to take up extended roles, it would

go a long way towards improving the quality of care to patients, especially in the rural communities. Support from the various professional groups is characterised below.

#### *5.6.3.1 Support from Medical Officers*

Medical officers across all three sites of the study offered their support for the introduction of role extension of radiography in Ghana. The medical officer at the site where there were no radiologists argued that the radiographers were already helping them with the interpretation of the images, if there was anything that could be done to enhance their skills in providing a more accurate interpretation, and in the process formalising it, that would help to improve patient care:

*The radiographers should be allowed to train and report on the X-rays.*

*That will be of great help to us (interview with PW 3 page 3)*

A medical officer at a site with one radiologist was of the view that his radiographs were interpreted for him by the radiographers when the facility had no radiologists and it was very helpful, so if the radiographers were to be offered further education to help extend their roles then he would be all for it. He further contended that most of the districts can make very good use of these radiographers since the radiologists are few and they will not accept work at such places. He further argued that similar programmes have been implemented within healthcare and it has been very useful, so there is a precedent to follow:

*It has worked in other parts of the clinical set up for example we are looking at even physicians in the consulting rooms we have physician assistants that help us with the minor things and the complex ones left*

*for the physician. I think that is a really good idea, initially majority of my radiographs were interpreted by the radiographer because I did not have a radiologist. A simple chest X-ray he will report to me saying clear enlargement of the heart or fluid accumulation, pleural oedema, simple straight forward things yes. If the training programme is really good enough they can actually take up majority of the job and leave the radiologists to focus on the more complex anatomical issues of the CT scan, MRI and maybe interventional issues (interview with PT2 page 4).*

It was the view of at least one medical officer that, in his facility, some radiographers actually helped in writing the radiologist reports, so it would be acceptable if their roles were extended as this could help reduce the burden of work on the radiologists.

*In my view we could train radiographers who actually take these X-rays already and have been doing the work. Some of them have actually been helping to write these reports already, all we need is to augment their training. We can train them, with that training they will be able to report these X-rays, so the toll of work on the radiologists is reduced (Interview PA7 page 4).*

*It was observed during the study that radiographers across all the sites especially those practising at places without radiologists have extended their roles in one way or the other. Radiographers are constantly involved in helping medical officers with interpretation of radiographs. This happens in facilities without radiologists and at facilities with*

*radiologists. In facilities with radiologists, the junior medical officers on duty at the emergency centre at night would always seek the opinion of the radiographers on duty on interpreting the radiographs. In facilities without radiologists, the medical officers always ask for the opinion of the radiographers if there are not certain of what they are seeing on the radiograph. What is central to all of this is what benefit will accrue to the patient in the end if radiographers are allowed to expand their scope of practice (Field Notes)*

The medical officers admitted that they found interpreting radiographs difficult, but where they do not have radiologists, they are left with no option than to attempt to interpret the radiographs with their limited specific knowledge. They contend that when faced with difficulty they seek the opinion of the radiographers:

*They are not reported, they are left to the clinicians to look at and then you add your clinical diagnosis and your clinical judgement. **It is tough but those that we have issues with we call them (radiographers) in to discuss with them to see the best option (interview PW3 page 2)***

#### **5.6.3.2 Support from Radiologists**

The support from radiologists was not unanimous; one of the three radiologist participants offered conditional support. He argued that the anatomy learnt by radiographers at undergraduate level was not sufficiently detailed and if the foundation of anatomy is weak, then there is no basis to build upon. He further contended that the curriculum of the undergraduate programme would have to be changed so that anatomy

was at the same level as for a medical student. After graduation they would need to undertake further education to extend their roles. He also posits that radiographers who have already qualified and are practising should not be a part of role extension. He also argued that radiographers would not be in a position to interpret radiographs because some radiographs have 'clinical implications' and without a medical background they would not be able to appreciate those clinical implications. He added however that it is not an idea that should be discarded altogether as it had merits:

*If they want that education they just have to begin training like they go through with the medical students like say anatomy and they go through with the medical students in full, then their anatomy basis will become solid, because in radiology your anatomy should be strong. After that whatever they think is feasible they push them in, the pathology and other things can be pushed in but the pathology should be pushed in as full pathology like the way the medical student will go through because the basics for the radiologists is that the basic thing he should have is the pathology to be that of the medical school before he can be put in the study to begin learning to become a radiologist (Interview PA2 page 8)*

However, another radiologist argued that role extension if introduced will help improve the quality of radiology services. He insisted that the education for role extension should be practical and hands on, rather than classroom-based education. He contended that if the education is geared towards a professional qualification rather than an academic qualification, the practitioners will benefit a lot more:

*I don't see it to be a bad idea broadening and widening the scope of what the radiographers can do but it has to be a professional degree or certificate that the person acquires and gets well trained. If it is going to happen in Ghana it will be good, imaging is improving, a lot of CT scans are coming in a lot of MRIs are coming in and the number of radiologists is still woefully inadequate apart from the skewness of the distribution. The whole radiology fraternity is still small in Ghana so if we have that it will help (interview PTI page 8).*

Similarly, other radiologists were in full support for the introduction of role extension in radiography but advocated that it should be well structured and that the policy should come from government. They argued that if role extension is backed by government policy and well structured, it would help improve healthcare delivery especially in places where there are no radiologists. They further contend that there is a similar programme in the United States of America (<https://www.asrt.org/main/careers/radiologist-assistant>).

They pointed to the fact that the introduction of a similar programme, for nurses to be trained as physician assistants so they could examine patients and make prescriptions, was opposed by some physicians with the argument that they would not be able to offer anything useful in the delivery of healthcare. However, nurses have proved to be very effective in districts where there are no doctors. They are therefore of the view that if this was to be introduced, it would help in improving the delivery of quality healthcare to patients across the country. The field of radiology is expanding rapidly and the need for radiology services is increasing but without a corresponding increase in personnel, so this would go a long way to help:

*Has to be spear headed by the MoH, you see it is the MoH or GHS they have to spear head that. The university I don't think is in a position to do that. It is GHS that should do that to boost the capacity of their human resource. You understand what I am saying, therefore it is GHS that has to come out with a programme like that. Elsewhere, at least in the US, there is a programme that they call radiologists assistant, like how we have physician assistants so that areas that doctors are not there we have trained nurses who will be able to give prescriptions, that programme was carried out by the GHS and MoH, so they have to come up with a programme like the radiologists assistant so that at least all the district and regional hospitals can be covered (interview PA8 page 4)*

Some participants argued that the radiographers are already trained in pattern recognition and image interpretation, so this education offers them the ability to identify straightforward cases of the common diseases which are prevalent in Ghana. This places them as the best-qualified professionals to interpret images in the absence of radiologists. This education is however not sufficient to enable them write reports on radiographs. A radiologist involved in both clinical practice and education of radiographers argued that radiographers are well placed to offer an informed opinion:

*Well I teach them pathology and pattern recognition and normally it is at the level 400 (final year) stage when they are almost ready for the market. At least for them to appreciate the job that the radiologists do with interpretation and what I realise is that most of them may end up in the centres that does not have radiologists so that after producing the*

*image, they still at least have an idea of whatever is going on and even if the medical doctor is not aware they can prompt him that this one is this or that (interview PA8 page 4).*

Radiologist participants have argued that the level of education medical officers receive on image interpretation is not enough to support them in clinical practice in the absence of radiologists. A radiologist involved in the education of medical students argued that the medical students are supposed to have training in image interpretation for eight weeks in medical school but revealed even that is not guaranteed. He therefore contends that there are very few pathologies that the medical officers might be able to interpret reliably; the danger being that the medical officers do not know their limitations and proceed to interpret the images beyond the scope of their knowledge, with unknown consequences for patient management:

*I think that it is the case that many of the X-rays, I say it every day to the people I get the opportunity to discuss imaging with, especially when I am teaching the medical students, the exposure we are giving the current medical students I did not get that, I did not get the full eight weeks rotation in radiology and so looking at X-rays they were few things you could appreciate and that is what the current crop of doctors are doing. They look at the X-rays and whatever their limitation is that is what they work with. So yes, they may have wrongly interpreted one X-ray or the other and start treating or over interpret it (interview with PT1 page 7.).*



## 5.7 Conclusion

There is a shortage of radiologists which is made worse by a skewed distribution. This situation has resulted in most of the radiographs produced being unreported, thus affecting the quality of healthcare. Radiographers with a professional ambition for recognition and professional autonomy are advocating for the introduction of role extension. They argued that the introduction of role extension would improve upon the quality of healthcare by reducing the report turnaround time and would increase the quantity of radiographs that are reported. Other healthcare professionals such as medical officers and radiologists support this agitation. The radiologists and medical officers were of the view that the introduction of role extension would help improve radiology services since there is a growing demand for them without a corresponding increase in the number of radiologists. The medical officers argued that they already sought the advice of radiographers in interpreting images that they have difficulty with and if they were given further education and professional autonomy to interpret images that would be very helpful.

The challenges in professional practice include the poor maintenance culture of equipment in use, this has led to frequent equipment breakdown which affects the smooth flow of work. The lack of effective consultation, resulting in expert input either not being sought or even when sought being discounted, has resulted in the purchase of equipment not fit for purpose.

There is a general shortage of consumables and basic facilities to aid the flow of work. This situation thus makes working more difficult than it normally would be and affects the quality of healthcare delivered to patients.

The next theme discusses education and training for role extension. There is a need for the education and training of radiographers to enable extended practice in radiography in Ghana. The theme on education and training explores the type of education and training that will be required by radiographers before they can extend their role.

## Chapter Six

### Education and training.

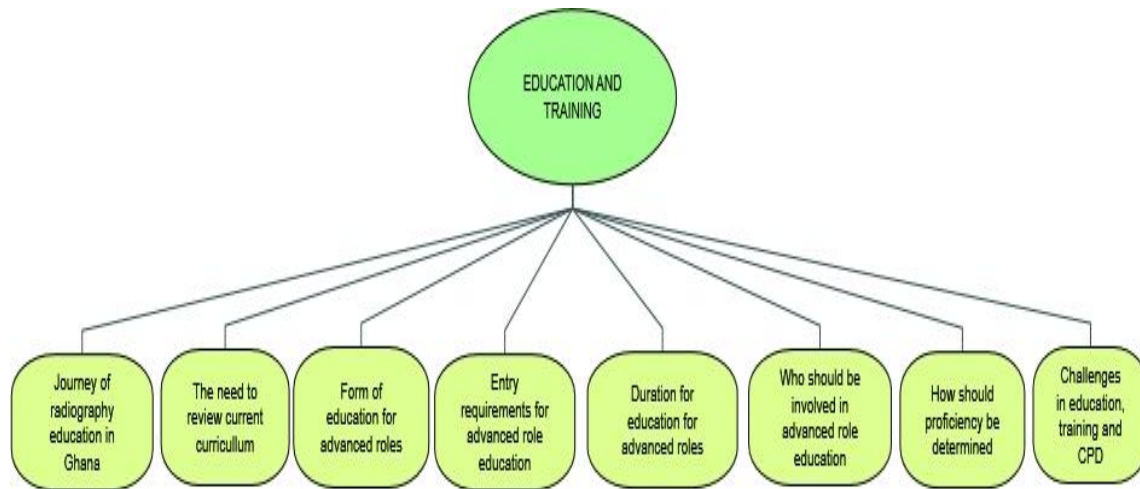


Figure 6.1 Schematic diagram of education and training for role extension in diagnostic radiography.

Figure 6.1 shows the theme and various subthemes relating to education. This theme takes us through the various phases that radiography education has gone through from the inception of radiography education in Ghana to date. The theme also explores the need to review the current curriculum of education to better prepare radiographers for role extension in the future. The form and type of education that will be needed for role extension, what should constitute the entry requirement, whether prior clinical practice should be an entry requirement and the duration of the education is also explored. The way in which proficiency should be measured during education for role extension is discussed and who should be involved in the education is explored as well. Finally, the chapter concludes with challenges that are faced in radiography education in Ghana, with the aim of informing policy so that these challenges can be addressed in education for role extension.

## 6.1 Introduction

Education and training are key determinants of the quality of practice for any profession. It is therefore important to explore the journey of radiography education and training in radiography in Ghana. This exploration seeks to establish how radiography training started in Ghana, how it has evolved through the various phases of change in the profession and its current state. This will give an idea of developments in radiography education over the years and what needs to be done to enable radiographers in Ghana to extend their roles. This chapter also explores the form or type of education and training that will be required to enable radiographers to extend their roles in Ghana. Who should be involved in education and training for extended roles is explored and finally the entry requirements for the programme to extend roles.

## 6.2 History of radiography education in Ghana

Radiography education in Ghana was initially under the MoH. It is not exactly clear when this school was established, however the first Ghanaian to head the school was appointed in 1951. The school was under the Human Resource Development unit of the MoH. It was a three-year programme and served as the only radiography education programme in the country. The graduates were awarded a certificate of qualification to practice. This situation continued largely unchanged for about four decades. The personnel, upon successful completion, were called X-ray operators, later called X-ray technicians and finally radiologic technicians. They were posted by the MoH to operate the various radiology departments across the country, in hospitals owned by the government. This

practice continued until there was a policy decision to start a diploma programme for radiography education under the University of Ghana, this is explained by a radiographer in higher education:

*Radiography education in Ghana has undergone several stages, initially radiographers were trained by the MoH. It was not a university wide programme; it was a three-year programme and it was at the certificate level. When one completes the programme, he/she is called a radiological technician, even previously it was X-ray operator then X-ray technician and it later changed to radiological technician. The programme transformed from a certificate programme to a diploma programme in the University of Ghana (Interview PA6 Page 1)*

Radiography education faced a number of financial challenges after the introduction of the diploma programme in 2001, this programme ran concurrently with the MoH certificate programme. The burden on the MoH had doubled because it was supposed to financially support the University of Ghana in running the diploma programme and at the same time it had to continuously support the certificate programme that was running. A year after the diploma programme started the University of Ghana introduced a degree programme as well. Its introduction led to a clamour to follow this route by graduates from the certificate programme and later from the diploma programme. The students from the certificate programme were required to spend a further three years in education to be awarded a bachelor's degree, whilst graduates of the diploma programme were to spend two years. Eventually both the diploma and certificate programmes were stopped, mainly due to lack of funds, and the clamour for the degree programme once it started:

*It started as a diploma in 2001 and the degree programme in 2002 and we run both concurrently. At a point those who had taken the certificate programme came in to do a one year top up to gain the university certificate as diploma and at that time if one had a diploma and you wanted the degree, you will have to do a 2-year top up programme at the university to have the first degree. The certificate and diploma programmes were both stopped (Interview PA6 Page 1)*

The basic qualification for radiographers in Ghana is now the bachelor's degree, both the certificate and diploma streams were stopped in 2003 and 2008 respectively.

Radiographer participants argue that radiography education has over the years been advancing and expanding in its scope. They explained that radiography education has extended into areas that have predominantly been within the scope of radiologists in Ghana. They explained that Kwame Nkrumah University of Science and Technology (KNUST) has introduced an undergraduate programme in sonography, thereby bringing sonography within the scope of radiographer education, hitherto within the domain of radiologists in Ghana:

*Until recently sonography or ultrasound was something like the preserve of the radiologists, but for now, radiographers have gone into it, there is a programme going on in KNUST that educates basic sonographers, so in that case radiographers have now joined in ultrasound imaging. Then apart from KNUST there is a postgraduate programme in ultrasound in the University of Ghana, they also have competence in ultrasound imaging (Interview PA3 Page 2)*

Participants explained that radiography education has developed and now covers almost all aspects of the profession, for example, a school within the College of Health Sciences of the University of Ghana has recently introduced postgraduate programmes in the area of radiation protection and administration. These programmes are training personnel who will take on roles as radiation protection or safety officers in the various facilities across the country:

*The School Nuclear and Allied sciences of the University of Ghana have postgraduate programmes in these, and some radiographers have gone through them, they obtain a postgraduate qualification. These people serve as radiation protection officers in their facilities (Interview PA3 Page 2)*

A participant in higher education indicated that the university was currently reviewing its curriculum to include new areas: specific mention was made of advanced imaging modalities and the possibility of creating specialist routes for radiographers beyond the current scope of practice. The universities are also exploring the possibility of introducing research based postgraduate programmes in the form of a Master of Philosophy (MPhil):

*Later with the degree programme we were able to move further to introduce the first master's programme in ultrasound, so that is the level that we have reached now. We are about to develop the curriculum again to widen the master's programme to MPhil to specific areas of the practice like trauma radiography, MRI, advance imaging in MRI, CT and*

*interventional procedures and those things. That is what we are planning now (Interview PA6 Page 1)*

### 6.3 Challenges in education, training and continuous professional development

There are inevitably challenges that are being faced currently in education, training and continuous professional development. It is important that these challenges are explored and taken into consideration in developing policies for education and training in extended roles. These challenges are discussed below.

Continuous Professional Development (CPD) post qualification is a way of ensuring that practitioners are exposed to current trends of best practice. However, one radiographer contended that CPD in some instances has been a challenge as management is unwilling to grant radiographers permission to attend training programmes, which typically will take them away from clinical practice for a few days. In the researcher's experience there has always been a struggle between radiographers and their employers to gain permission to continuously upgrade their skills and meet the mandatory requirements set by the AHPC, the regulator of allied health practice in Ghana. Currently in Ghana, training for CPD is not offered online so the only way to maintain CPD is by attending in person. A radiographer needs ten CPD points to renew their license every year. It is therefore difficult to understand why an employer would stand in the way of an employee who wants to not only upgrade their skills but also to be able to remain on the register to practise:

*There are challenges in practise and with respect to furthering your education which has to do with your continuous professional*



*development (CPD), sometimes some of us have hit stumbling blocks with the administration and it has been a tug of war to get approval to go for CPD (interview with PT3 page 2)*

Some participants argued that postgraduate education is actually a disincentive in the clinical practice of radiography in Ghana. This is because the current salary structure does not have placement for radiographers beyond the basic qualification of a first degree. Thus, regardless of whatever qualification one acquires beyond the basic qualification, it does not play any role in the placement on the salary structure. More emphasis is placed on the length of practice than on additional qualifications acquired. This serves as a disincentive as radiographers do not see the need to acquire more skills if they will not benefit financially. It is therefore important that notice be taken of the fact that if additional qualifications do not contribute to the earnings of a radiographer, there is no incentive for a radiographer to seek to acquire them:

*Money is a big thing that can motivate or demotivate people, so I think that if you could train someone and he is coming back after learning so hard and he is not seeing the benefit of it, he will not even want to give of his best. For instance, the person was taking 1 cedi and he is gone for training and come back, and he is still taking 1 cedi, he will not be motivated to do what he has even gone to learn. So, I think that there should be proper structures in place so that if you have acquired additional skills, you should have levels where the salary will accordingly be upgraded so that people will not feel that they have been trained and they don't have a place (interview with PA4 page 6).*

Participants also contend that the fact that additional qualifications do not contribute towards an increase in the earning power of radiographers, affects retention of radiographers in clinical practice. Most radiographers who have undertaken postgraduate education leave clinical practice for academia, because that is the only place in Ghana where postgraduate qualifications in radiography are recognised and contribute towards the earnings of the holder. The clinical setting in the end is the loser, experienced staff that have undertaken further training leave clinical practice for academia. It is only reasonable to work in an institution where your academic qualifications will be reflected in your earnings:

*For instance, I do my master's or MPhil and come back only to be told to stay on the same scale without seeing any significant change and there is an institution or a teaching field which is going to put me on a different scale, definitely it will affect the hospital for I will leave and join the teaching field (interview with PT4 page 7).*

#### 6.4 Review of current curriculum

The curriculum used in education is critical to the outcome of the programme. Some participants have argued that the current curriculum will need to be reviewed in order to prepare radiographers to take on extended roles. Others have argued that the review of the curriculum should be done because it is important to have a solid foundation that can then be built upon at the postgraduate level, to enable radiographers to extend their roles. These complementary views are explored below.

One radiographer expressed his doubts about the ability of the Ghanaian educational system to educate radiographers for extended roles. He did not believe that academia has contemplated the idea of extended roles in radiography, hence his doubts about the readiness of the educational system in Ghana to carry it out. He therefore advocates that the education for role extension be done abroad:

*I don't think we have the capacity to train here locally, I don't think so because locally even the radiologists that graduate is about 6 or 10 so which means we have to have a whole new set of curricula for role extension, so they go through the training or train probably abroad. I am not sure the academia here has thought about it (Interview PA1 Page 3).*

One radiologist claimed that the curriculum being used for radiographer education in Ghana would have to be changed at the undergraduate level. He argued that the curriculum does not provide radiographers with a strong enough foundation to be built upon for role extension. He added that radiographers who are in practice should not be part of role extension because their foundation is not strong enough to support it. He further argued that the curriculum at the undergraduate level has to be strengthened first, and the products from the strengthened undergraduate programme upon completion can then acquire further education for extended roles. It is worthy of note that this participant is not involved with the education of radiographers and his arguments in relation to the curriculum were based on an assumption of what the contents of current radiography curriculum entails:

*The radiography school ought to have a review of their curriculum. If that is done and they strengthen the anatomy, they strengthen the pathology and other things, then when they move out, things of this sort can be done. You cannot just begin that today those that are out there and working should be made to do that. If you have that in mind you have to plan from next 3 or 4 years we will like to do this so let's make a little change in the curriculum, let this people have more knowledge on this and that and that, so that when they come out and they are moving out to do this or that it won't be very difficult for them. The undergraduate curriculum needs to be changed and strengthened and they when they come out, they can now take a course post qualification to do the reporting (Interview PA2 Page 9).*

The institutions of higher education would have to review their curriculum to include areas that facilitate the ability of radiographers to take up extended roles. It is further argued that this should be done with the local situation in mind, so that the solutions provided are tailored to the local needs of the country:

*The school should look at what is needed in our environment in terms of role extension and incorporate it in the curriculum, with the mind-set that is going to solve the problem that we have on the ground (Interview PA4 page 9).*

Participants argued that the review of the curriculum should be done such that by the end of the programme each radiographer would have the ability to interpret images. This they argued is important because the rural communities in Ghana do not only lack radiologists,

but in some cases medical officers are also not available. It was advocated that the undergraduate curriculum be reviewed so that each radiographer at registration is qualified to provide preliminary comments on the radiographs. The radiological requests, in some rural areas, are made by healthcare personnel that do not have any training in image interpretation and this affects the quality of healthcare that patients receive in these areas:

*There is a need that in our rural areas and other areas where there are no radiologists, patients are suffering because they don't get the right reports, we could include that in our curriculum and make it a point that radiographers before you graduate should have this skills initial commenting so that when they go out there they can do it (Interview PA4 page 9)*

However, a radiographer in higher education argued that the current curriculum used for radiographer education is a good one as it was adopted from the UK and fine-tuned to meet the local needs of Ghana. He argued that not only is the curriculum comparable to any such curriculum internationally, it is also regularly reviewed and updated to meet the changing demands of the profession. He therefore posits that if radiographers in the UK, who are educated using a similar curriculum, are able to build upon that education at postgraduate level to extend their roles, he does not see any reason why Ghana should be different if that becomes the policy:

*The curriculum we are using is one that was adopted from the UK, so it is a curriculum that has been tried outside Ghana. Currently the UK has*

*moved into having role extension incorporated in their educational system as well as image reporting, so this year we had a summit and we have also reviewed our curriculum to put in place some of these role extension programmes in there (Interview PA4 Page 9).*

Again, the curriculum used in radiography education has been described as being robust and in tandem with radiography curricula used in the UK and Australia by international external examiners. It is argued that in developing the curriculum in Ghana, various curricula from different countries internationally were used as a guide to help design a robust curriculum. It is further argued that graduates from the Ghanaian system have fitted in well internationally after completion of their education. Graduates from the certificate programme have been able to continue their education at the postgraduate level in the UK, this is testimony to the fact that the UK accepts that the level of education in Ghana is of a high standard as claimed by a radiographer in higher education:

*In developing a curriculum you look at it in a way that you have examined other curricula around, so you look at schools in UK, Australia and even the USA and then you pull things together so that you will also have a curriculum which suits the international or which is acceptable internationally. So even if you look at comments made by our external examiners, when we were running the certificate programme when our products go to UK for instance, they were made to do an abridged programme and moved to the master's level (Interview PA6 Page 2).*

Additionally, it was argued that the curriculum used in Ghana for radiography education is of a very high standard; professionals from the developed world, who have examined

the curriculum, contend that it is a very detailed and good curriculum for radiography education. It is thus suggested that the level of training received by Ghanaian radiographers is comparable to that of radiographers anywhere in the world:

*Our level of training is very good, especially when people come from outside of Africa, they appreciate our training, recently we had some visitors from the USA, they saw our training as heavily packed, in fact they appreciated our curriculum (Interview PA3 Page 3).*

One radiologist involved in the education of radiographers posits that the education is adequate for them to identify the basic conditions that they will encounter in their practice, however the concern is when they come across what he terms as 'complex conditions'. He further argued that the education gives them the principles that are required for image interpretation and the basic pathology that is needed to guide one in making an interpretation of images. He is therefore confident that the current education being offered to radiographers, puts them in a good position to identify the most basic of conditions that the medical officers might not be able to identify:

*We make sure that we teach them the basic pathology and the basic principles for image interpretation so with that the common illness that they encounter they can at least give an informed opinion but the complex ones that is where the challenge may be. But at least for the simple diagnosis they can identify the pathologies (Interview PA8 Page 5).*

## 6.5 Type of education for role extension

There were varying views and ideas evident with regard to the type of education needed for role extension expressed by participants and the justification offered for those views.

One radiographer argued that the education should be more hands on rather than classroom based. This he justifies by arguing that if it is more practical, the radiographer could remain in clinical practice whilst they understudy a radiologist. The radiographer would interpret the radiographs and the radiologist would then double check it and either agree or disagree with the radiographer and make necessary corrections. The radiographer would be required to have correctly interpreted a given number of radiographs correctly over a period of time to be deemed to have gained enough competence for independent practice.

*Perhaps it should not be that much of a theoretical thing anymore, much of it should be practical. It should be that you will have to do this number of chest X-ray reports and the radiologists will be convinced. I should report on the films and the radiologists will compare the reports with what he sees on the radiograph. Then my mistakes will be pointed out to me. I could be practising and be doing the course for the next year (Interview PW1 Page 9).*

Similarly, another participant advocated for a more practical training, he however emphasised the need for theoretical education as well but argued that greater emphasis should be on more practical hands on education.



*I think for role extension it should be hands on, you will get the theoretical bit, but it most definitely will be hands on (Interview PA1 Page 4)*

In contrast, some participants argued that the education should be focused on the achievement of a professional degree, they contend that the master's programme may be limiting as such programmes seek to have a narrow focus. They further argued that a professional degree would be more flexible and better suited to role extension; however they added that the title given to the programme is not important but that the format and structure should be that of a professional degree rather than a master's programme.

*Honestly a master's programme seeks to have a focus. If it is a professional degree, it may be a bit versatile than a master's degree. It can be a diploma or just a degree but how the content is structured is more important. You can even call it a master's degree but has to be structured differently from a traditional master's degree (Interview PT1 Page 9)*

Participants further argued that the education has to be well structured and has to take place on site. They argued that distance education or the use of technology where trainee radiographers are not physically present for the training would be detrimental. They explained that education for extended roles should not be undertaken by distance learning; it was argued that this could affect the quality of education if it is done via technology. However, when participants' attention was drawn to the fact that technology had been used in other jurisdictions as part of the education for role extension, they were still adamant and insisted that was not the best way to educate radiographers for image

interpretation. The need for the education to be limited to particular areas or specialities is also advocated.

*The radiographers look so close because they have a background in imaging, so they can do that, but it has to be a formalized training into particular areas and also it has to be on site, most of it has to be on site, I do not believe in the distance learning of image interpretation (Interview PT1 Page 11)*

Another participant argued that education should be at postgraduate level so that the programme could be more focused as this is more likely to have definite programme goals and objectives. This is in sharp contrast with the position of the participant above. The participant is against a traditional master's programme because it is focused and this participant is in support of a traditional master's programme because it is focused:

*Yes generally it should be a postgraduate programme so that there is more focus on the programme (Interview PA5 Page 5).*

Radiographers are technically inclined, implying that education should be clinically orientated so that trainees are given education on how pathologies and conditions present on a radiograph as this would help them with interpretation of images. A medical officer contends that this would be very useful to the trainees:

*I will want it to be more of the let me put it in quotes clinically oriented images because I think radiographers are more for the technical areas but if they are more trained towards clinical presentations and situations that will help a lot (Interview PT2 Page 4)*

One radiographer participant is more concerned with the practitioners being awarded a certificate for the education than with the type of education. He argued that if the programme has been sanctioned by the relevant authorities and certificates have been awarded to the practitioners at the end of their education, then that is more important to him than the type or form of education. It can be at postgraduate certificate, diploma or master's levels:

*It could be at any level but at the end of that training, there should be certification so that you can have a backing when you are doing that extended job. It could be at any, it could be a postgraduate certificate, postgraduate diploma or master's degree (Interview PT4 Page 5)*

The importance of performing a needs assessment of the situation in Ghana to determine in which areas radiographers will require further education before arriving at the type of education that should be used, was emphasised by one radiographer in academia. He also contended that education would most probably be multifaceted:

*I think that the education could be multifaceted. We need to do what we call needs assessment to see what radiographers actually need in order to improve their film commenting or reporting skills (Interview PA4 Page 4).*

Furthermore, he argued that the GSR could establish a college of radiography that would be tasked with the responsibility of offering education for radiographers seeking to extend their roles. The college could have various units that are responsible for handling the branches and specialties in radiology:

*We can have college of radiographers which can also oversee the activities of this education and empowering people to go into role extension, for instance if it is image reporting we can have a branch of the college dealing with image reporting and we can have other branches looking at other parts of role extension (Interview PA4 Page 5)*

Similarly, a senior official of AHPC argued for a college of allied health in which radiography would be a department. This department would be responsible for the education of radiographers who want to extend their roles. He added that this was a policy being examined by the AHPC and the MoH with support from the various professional bodies within the allied health fraternity:

*What the council is doing together with the MoH and also with the support of the professional body is to have a Ghana College of Allied Health and then the various professions can have faculties in the college and obviously radiography should be one of the faculties and then people can then go in and do specialisation and take on extended practice (Interview PA9 Page 3).*

One radiographer advocated for education that would place emphasis on how to identify pathologies radiologically in all the available imaging modalities. He also emphasised the need for the pathology training to be geared towards how to identify these pathologies on radiographs and on ultrasound scans, otherwise it will just be theoretical and not helpful to the trainees, nor the service:

*I will go for more in-depth training in pathology with more emphasis on radiological pathology so as to know what they are seeing, that will encompass the various imaging modalities that are available, the conventional X-ray, CT scan, MRI, ultrasound. The training should be such that they are able to detect various pathologies with very minimal misses (Interview PA5 Page 5).*

Additionally, a documentary review of the legislative instrument for ACT 857 (2013) indicated that provision had been made on the minimum qualification one has to attain to become an advanced practitioner, also referred to in the document as a reporting radiographer. It is also specifically required that the programme should be accredited locally by the AHPC or internationally by the relevant authorities in the countries where the institutions are located. It is further emphasised that the programmes must be at the postgraduate level. The document states in part:

*The minimum certification for reporting Radiographer is a post graduate level qualification as listed below.*

*A postgraduate certificate (PgC) or postgraduate diploma (PgD) or MSc that has been accredited internationally or locally by the National Accreditation Board, Allied Health Professions Council and the College of Radiographers. Education provision at this level is required to take cognizance of postgraduate outcomes as identified internationally by the World Health Organization.*

Another radiologist argued that a professional education was more practical and hands on rather than an academic education which places emphasis on theory rather than the practical work. He contends that the practitioners should be assigned to radiologist mentors under whom they will study. The mentors will continuously monitor their performance over time and when he or she is satisfied that the mentee has attained a level of proficiency that is satisfactory, the mentor certifies that the mentee is now qualified to practice extended roles. He also added that the conditions and duration of the study should be set out by the governing council:

*It should be like a form of professional training, professional certificate not an academic certificate, you understand, the professional ones you have to work on the job not certificate oo so that you report with the people who do it and they are satisfied that yes, mr A can work on his own in this area, you understand, you must work under somebody for some period of time, 2 years, 3 years or 1 year, whatever the council deem it and then after that the person can sign that yes this person has worked with me he has seen all the cases that he needs to see and I can vouch that he will do a good job (Interview PA8 Page 6)*

## 6.6 Minimum requirements for extended role education

Participants expressed various views on the basic requirements that should be met before a radiographer is allowed to enrol on to the programme leading to role extension. This section explores the views expressed on this subject.

Some participants argued that one of the entry requirements should be a minimum number of years of clinical practice experience. However, they do not state how long this clinical practice should be.

*One must also have been in practice as a radiographer for some time before being allowed to extend your role for instance imagine me doing the procedures with someone who is just probably two years in practice, the difference will be clear, so it really should be checked well (Interview PW1 Page 10)*

Similarly, a participant argued that the experience acquired will place radiographers in a better position to effectively extend their roles. He is therefore of the firm belief that radiographers should have acquired relevant clinical practice experience as a requirement before being allowed to enrol on the programme:

*I think when you complete training as a radiographer you should get some experience, I think when you have the experience it will place you better for role extension because you would have gathered some experience practising (Interview PW2 Page 5)*

This view is supported by a radiographer who contends that five years of clinical experience would expose the potential practitioner to most clinical issues that are faced by radiographers. The potential practitioner would also have been exposed to various pathologies and how they present clinically on radiographs so that education would be easier to appreciate:

*I will advocate for, a minimum of 5 years post qualification experience so that you know that once you are coming in you have 5 years' experience in clinical practice (Interview PA5 Page 5).*

However, one radiographer in higher education, whilst agreeing that there is a need for potential practitioners to acquire some clinical experience before enrolling on the programme, argued that three years of clinical practice should be enough, especially if the radiographer holds a bachelor's degree in radiography. He is however quick to add that the number of years of clinical experience that should be acquired by practitioners to enable them to enrol onto the programme should vary depending on which area of role extension the practitioner is seeking to enrol on:

*I think that if a radiographer wants to extend their role, they should have at least a BSc in my opinion and should have worked for at least 3 years. At least he would have acquired some skills, but it should also depend on the area of role extension, I do not think we should have just one bracket for all (Interview PA4 page 6).*

He further argued that radiographers, who are holders of a diploma in radiography, should be required to have acquired at least 5 years of post-qualification clinical practice experience in order to enrol on the programme. He is thus proposing a different set of entry requirements for radiographers depending on whether they are holders of a bachelor's degree or a diploma:



*If you hold a diploma and want to do role extension in let's say reporting, you should have been practicing for not less than 5 years and you are competent to be trained (interview PA4 page 6).*

Additionally, the legislative instrument for ACT 857 (2013) outlines the entry requirements for programmes leading to role extension. The course is designed for postgraduate studies, as such one of the requirements is a first degree in a radiography related field. The legislative instrument does not mention a clinical practice experience element as a requirement as was suggested by most participants. The certificates that will be awarded at the completion of the course could be a postgraduate certificate, postgraduate diploma or masters of science (MSc):

*Entry criteria to these postgraduate courses are limited to an initial first-degree Radiography related qualification. Hence courses will be at post registration level leading to a minimum award of a postgraduate certificate. These courses prepare individuals for specialist or advanced practice rather than entry-level practice.*

Furthermore, a radiologist buttresses the need to have relevant clinical practice experience before one is qualified to enrol on the programme. He argued that, the radiographer he works with has shown that, with clinical experience gathered over many years of practice, he is able to make a valuable input to the various radiographs that he produces. He further contends that whenever the said radiographer produces a radiograph and expresses the opinion that a patient might need an additional projection, he is usually correct. He is therefore convinced that the radiographer is able to offer

insightful opinions because of the clinical experience he has gathered over the years and advocates that that should be a requirement for enrolling on to the programme.

*It will be better in the sense that the person will have the flair for the radiography work and then would have gained experience in the number films he has produced and have looked at. Let us take here for instance my radiographer is good at the radiography, and their clinical radiography he was taught, I believe he was good. If he calls you for something or tells you I want you to have a look, whether you will like another view or something or this film they didn't request for a report but I want you to have a look and if possible you give a report, I need to rush to the place, because whatever he is saying it goes with it (Interview PA2 Page 10)*

Equally, another radiologist argued that, beyond clinical experience there should be additional conditions. He contends that in addition to clinical experience, potential practitioners must be attached to the hospitals that will require their services, the hospitals will nominate and sponsor the radiographers to undertake education. He argued that this will serve as a way of ensuring that the services of the radiographers who have extended their roles will be available at the places where they are needed most. He added that without this condition the tendency of most of these radiographers would be to practice within the big cities, to the detriment of the rural hospitals and the whole essence of the programme would be lost. He also added that one of the requirements should be to make it compulsory for the radiographers, after completion of the programme, to go back to the hospitals that nominated them. This would serve as an incentive to encourage

radiographers to accept a post in the rural areas with the hope that their hospital will nominate them to extend their role.

*I think conditions should exist and not just the conditions, we should have institutions that you are coming from, supporting you to come so that it makes it mandatory for you to go back. It becomes difficult to control it, some people will just say immediately after radiography programme he gets started, he has not worked anywhere apart from his internship and he has come back into this programme and when he finishes where does he go, you will realize that he is in Accra. But when your umbilical cord is attached to an institution that is saying we are supporting you and when you finish you come back to our place then it becomes easier getting those people back there. When you are coming you must have an institution sponsoring you, either fully or partially so that you know that is where you are going, and we are not training those people for the big centres. This condition will make sense (Interview PT1 Page 10).*

## 6.7 Duration of Education for Extended Practice

There is unanimity amongst participants with regard to the need for education for those radiographers seeking to extend their roles, the duration of the education however has been subject to differing views with many and varied opinions expressed. These opinions are explored in this section.

A participant argued that he is not particularly worried about the duration of the education once it has been sanctioned by the relevant powers. He contends that even if the programme took four years, he would be willing and ready to take part in it as it would enable him to extend his role. For him it is an opportunity that must be taken once it is offered and the duration of training would not serve as a disincentive that would discourage him from extending his role. The opportunity to extend his role is enough motivation for him regardless of the duration of the education:

*It just needs to be sanctioned that look you have the opportunity and even if it is two years or the so called 4 years kind of thing we don't mind. Now if I get that I am also going to stop working and go do it (Interview PW1 Page 9).*

However, he added that after several years of clinical practice he had gathered a lot of experience, he does not feel that he will need a long period of education in order to extend his role because he has seen many radiographs with differing and varied conditions. He just needs it to be sanctioned, for him that is the most important thing:

*Most times we might not just need a lot of training. What is it after seeing that number of X-rays with abnormalities what else will you need? It is just the sanction (Interview PW1 Page 9).*

Some participants argued that the undergraduate programme should be extended to five years so that it will cover extended roles. This would ensure that all radiographers upon qualification from the undergraduate programme are qualified to take up image interpretation rather than having to do a postgraduate programme to extend their role.

They added that a doctor of radiography degree should be introduced to replace the current bachelor's programme and the duration could then be extended to 5 years. This extra year should be used for education aimed at allowing radiographers to take up roles that are not currently within their scope:

*A 5-year programme or what the ophthalmology or laboratory guys do or doctor of radiography or something, if it is done properly 4 to 5 years (Interview PT2 Page 6).*

Further supporting the need for a longer duration of training, one radiographer argued that the duration should be a lengthy one (between 3 and 4 years) so that the trainees would be able to practise efficiently once they have finished the programme. He further argued that this kind of education should be similar to a fellowship programme.

*I think it should last like 3 or 4 years to make it more like a fellowship programme. So that by the time people will complete they will have the right to also practice efficiently (Interview PT3 Page 4)*

Some participants also argued that the duration should be dependent upon which area the radiographer seeks to extend their role, because some areas will require more time than others. However, they added that the duration should not be more than 18 months since the radiographers already have some level of knowledge in the mechanisms of pattern recognition and anatomy:

*Like I said it depends on what you are going to do but it should not be more than a year and half, because you already have the basics and the background so if for example they are training you to report on chest X-*

*rays for example or head CT scans alone, it should not be more than a year and a half. Basically, the anatomy, the physics and things we know all already, it is just the reporting (Interview PA1 Page 4).*

One participant contended that you cannot put a cap on the duration for the programme because the trainees should be attached to radiologists and those radiologists would assess them as they work with them. This would continue until a point where the radiologists are confident that the trainees would be able to practice independently with a high degree of accuracy. Only then can they be deemed to have completed the training. The duration will therefore depend on the trainee and how quickly they are able to show that they are capable of practising independently, with a high degree of accuracy:

*You cannot have time limits, what you have to do is that, the person will be with the radiologist and they will be going through things and when he thinks the trainee can report on the things with minimal or no help and he thinks the person can go, then you go and take another examination and you pass out (Interview PA2 Page 8).*

In contrast, a radiologist argued that even though using radiologist mentors is laudable, there is a need for other ways of assessing the proficiency of trainees rather than leaving it to the discretion of the radiologists. He further argued that in radiology residency, even though one is assigned a mentor, the resident still has to write the qualifying examination at the end of the residency and that is what ultimately determines their proficiency. He therefore advocates for a similar scheme.

*In radiology residence you stay in it until such a time that you are deemed fit to write the examination and you go write the examination and your passing out is subject to passing the examination. Your mentor who is your consultant could believe that you are good but if you fail the examination you are not going anywhere. So, when such a programme is rolled out the mentoring is necessary and objectively, I don't believe in keeping somebody because you have to keep that person, objectively they should be other ways of monitoring and reassessing than only just the mentor (Interview PT1 Page 10)*

Some participants agreed that the trainees should be attached to a radiologist who they will understudy; however, they proposed a period of education between a year or two rather than one without time limits. They further argued that the trainee should work under the supervision of a radiologist and that the radiologist would then countersign the trainee's work before they could be released. This would continue until the radiologist is able to attest that the trainee is qualified for independent practice:

*So that they attach you to somebody for a year or two and sometimes you will be doing the interpretation before the person comes and comes to go through your work and after a period of time he can say o he can do everything even in my absence (Interview PA8 Page 6).*

## 6.8 Who should be involved in the education for extended practice?

The Policy planning and implementation theme will discuss aspects of who should be involved in the education of radiographers for extended practice. This section, however, will explore more deeply who should be involved and why they should be involved.

Participants proffered different opinions; most of the opinions from each professional group were similar. Various professional groups have been proposed for inclusion in the education by participants for various reasons. These professionals include radiologists, experienced radiographers, orthopaedic surgeons, urologists, anatomists, pathologists and lawyers.

It was argued that anyone involved in the education should be more knowledgeable than the radiographers in the aspect of education that they will be handling. Radiologists fall within this category but many other specialists in various areas would also need to be included so that the programme is holistic. This mean that education could involve specialists in areas other than radiology:

*It should be from someone who should be a little more specialised than we are and for now in our country it is the radiologists but of cause it should take all facets of the specialised groups, it might not just be the radiologists we must have an understanding of all the specialities involved. So, I believe it should be from people we radiographers believe they know something more than we know (Interview PW1 Page 9)*



Additionally, one medical officer argued that a wide range of professionals would have to be involved in the education of radiographers for extended roles; he argued that experienced radiographers, people he referred to as industry stakeholders, anatomist and physiologists should all be involved. He contends that industry stakeholders would be needed because radiology is a dynamic profession and technological changes are happening constantly so there is a need to include industry stakeholders. He contends that with this group of experts, the education will be holistic and complete:

*Skilled radiographers naturally, the technical people because the radiographers work more of the machine, industry stakeholders because they are newer machines and equipment and newer technologies so there should be somebody there from the technology front and of course the clinical aspect of it not forgetting the anatomy and physiology (Interview PT2 Page 5).*

He further added that radiologists should be involved but this should be done only after all other aspects of the training have been completed. The radiologists would only be brought in to help with how to go about image interpretation:

*Radiologist should be included towards the end when it comes to interpretation of images and things like that (Interview PT2 Page 5)*

Similarly, a radiographer concurs that radiologists should be included in the education of radiographers for extended practice, however, he insists that the radiologists who would be involved should be radiologists with specialisation in particular areas. They would then

be brought in to help in those areas. This is the only way the trainees will really benefit from their expertise he claims:

*It is ok to bring radiologists on board as well, in particular I will even say if we have radiologists who are specialist, they have specialized in specific areas like neuro-radiologists, musculo-skeletal radiologists, these people can be brought on board for people to tap their knowledge so they can make input in whatever programme they want to put in place for radiography (Interview PT3 Page 4).*

Additionally, participants advocated for the inclusion of radiographers in the education if they had the requisite expertise to do so. They argued that radiographers should be chief advocates for the education and as such should be involved. They added that other specialists from various areas should be included as well if it were deemed necessary:

*Radiographers should be involved, if radiographers have the capacity to provide the training to the colleagues then they should champion the whole thing. If possible, there is the need to bring specialist from other areas also to handle some areas that they deem fit for specialist training in radiography (Interview PT3 Page 4)*

One radiographer posits that radiographer input to radiographers' education is likely to be more effective and without tension and animosity, rather than radiologist to radiographer education, due to traditional professional boundaries that have existed over the years. However, radiologists should not be totally excluded as their input will be needed at some point:

*Radiologists should be there, senior radiographers and I will even say the senior radiographers because radiographer, radiographer training is more smooth than when you come to radiologist radiographer but when it comes to this kind of reporting thing radiologists should be involved and they should be able to start from basic principles then gradually we build up (Interview PA3 Page 7)*

The decision on who should be involved in any aspect of the education should be based on the required expertise. For instance, if the education were about head computed tomography (CT) reporting then a radiologist with speciality in that area will be the best fit for that aspect of the course. One participant claims this is the best possible way forward:

*This will depend on for example if what we are going to train radiographer in, I am just giving an example; in interventional then we will probably need an interventionist to be part of the team (Interview PA1 Page 3)*

Furthermore, a case is made for the inclusion of radiographers who have already had education in advanced roles, mostly from UK universities, to be included in the programme. One radiographer in higher education argued that since they have had the benefit of being educated in advanced practice, they will serve as a good human resource to depend on in Ghana. He also argued that there are some radiologists in academia who are interested in the education of radiographers and have been involved in radiographer education so they could also be considered:

*We have radiographers who have training in image reporting already, we could invite them to come and give training; we also know that radiologists are the key people in reporting, so we can use radiologists. In our department at the University of Ghana we have radiologists who are with us and they have shown more interest in the development and training of radiographers, so I think that we can invite such people to come out with some syllabus or curriculum for training (Interview PA4 Page 4)*

The inclusion of a lawyer and experienced radiographers in the education programme was justified by one participant. He posited that the inclusion of a lawyer in the programme would ensure that all aspects of extended practice with medico-legal implications are understood. This would include staying within the scope for which one is qualified and how to deal with the legal responsibilities that come with extended practice thus raising the trainees' awareness of their legal responsibilities before they start in practice:

*A pathologist, a radiologist and a lawyer, these may be the main people and also experienced radiographers can also be brought on board to take some aspects of the training (Interview PA5 Page 6).*

More so, there would be a need to involve radiographers both in clinical practice and in academia. Participants argued that without the involvement of radiographers in clinical practice, even the images used in illustrations would be difficult to acquire. They further argued that since the roles that will be extended fall within the scope of radiologists, it is only proper that they are involved in the education. They have been working in the relevant area and should be well versed in the practicalities and intricacies of practice:

*It is both those in academia and clinical areas, because if it is role extension, for instance image interpretation by radiographers, we will by all means need the assistance of radiologists, you will also need the assistance of radiographers in the clinical areas' cooperation (Interview PA6 Page 3)*

## 6.9 How should competence be determined?

Determining the competence of radiographers who have received the required education to extend their roles is important, it will serve as a mechanism to ensure that only people who can practice to a set standard are certified to practice. Therefore, selecting a method of assessing the competence of practitioners throughout the education is key. Various participants have proposed ways of assessing practitioners and these are explored in this section.

One radiographer opined that there is a need for the regulators of extended practice to have a way of measuring the output of practitioners undertaking the programme. This he argued will ensure that if the output of the participants is deemed not to be up to standard, the participant can either be withdrawn or will not be allowed to practice in any extended roles so that standards can be maintained. He falls short of proposing a means of assessing the participants:

*If they should extend roles, before you are given the go ahead to practice with extended roles, they should be satisfied with your output and if they are not satisfied with your output it should be possible to withdraw you (Interview PW1 Page 10).*

Similarly, some participants argued that throughout the programme the participants should be examined to assess their competence before they are duly certified as qualified to practice. They claim a qualifying examination would be one way of ensuring that the radiographers being certified to extend their roles are indeed qualified to do so:

*I think before they qualify, they will have to sit an examination and the necessary people who will have to certify that they are proficient would have done so before they are allowed to practice (Interview PW2 Page 6)*

Image interpretation is done by humans and as such there is a possibility of error since humans are fallible. It is therefore advocated that the standards set for practitioners to meet, before they are deemed proficient to practice, should take that into consideration. Participants argued that if this is not done there could be a tendency to set standards too high so that very few practitioners, if any at all, will be able to meet them:

*Let's bear in mind that it is a human environment and it is user dependent, if we don't take care we will set a very high standard that we can never get someone to work in, because as we speak now radiologist still make mistakes because they are still working based on what they see (Interview PA5 page 7).*

They further argued that a reasonable standard would be a percentage not below seventy percent (70%) in the examination conducted for the programme. Anything below seventy percent (70%) would be unacceptable, they added:

*Seventy percent (70%) is fine eighty percent (80%) is fine but below 70% no (Interview PA5 page 7).*

The standards for proficiency should be set very high because when the practitioners have completed the programme, they will become independent practitioners. One participant argued that if this is not done, they are likely to give out reports that might be incorrect:

*It should be high because eventually you will be left on your own to determine diagnosis and all that. If you are not proficient you know what will happen, you will give wrong diagnosis (Interview PA1 page 5).*

Additionally, examination throughout the programme should be very rigorous, similar to examinations that are taken at the university level. Participants advocated for trainees to be required, as part of the programme, to conduct research in whichever area they are studying and present their dissertation for assessment at the end of the course. They argued that this would increase the trainees' interest in research, and they would be likely to continue after qualifying:

*People should go through the vigorous aspects just like university education where you have to go through exams and project work for whatever areas of research you are undertaking, for it to be assessed so that people can evaluate with confidence they can say that the person is up to standard and fit to practice (Interview PT3 Page 6)*

It is also important that participants in the programme should be able to correctly interpret a minimum number of radiographs for each part of the body before graduation. Participants further contend that the quantity of radiographs interpreted should vary

depending on the part of the body, as some examinations such as chest radiographs are more common than pelvic radiographs for example. They therefore argued that the requirement should be to interpret more of the commonly encountered radiographs than the less commonly encountered ones.

*I will recommend that each part that they are going to specialise in reporting, there should be a minimum number of films that they should have seen, chest X-rays are the commonest X-rays that they will ever come across, so for chest X-rays I will go for a minimum of 1000 reports before they pass out, for parts like the spine I will go for about 500 reports before they pass out, pelvic and skull can go for like 200 before they pass out, the limbs can go for about 500 as well before they pass out (Interview PA5 Page 7).*

Lastly, a radiologist suggested that trainees should complete a qualifying examination before graduating and this examination should have a theory component as well as a clinical component. He argued that this will afford the trainees the opportunity to prove their competence both theoretically and clinically:

*For every examination they should be the theoretical exams and the clinical part so that is how it should be (Interview PA2 Page 8)*

## 6.10 Conclusion.

This chapter examined the current state of radiography education and training through the various phases. The challenges faced in radiography education and training and the challenges in continuous professional development were also explored so that it could



serve as a guide in formulating policies for education and training towards role extension. Some participants argued that Ghana does not have capacity for the required education and training of radiographers to enable them to extend their roles, they therefore advocated for training to be undertaken abroad until such a time that capacity is developed locally. Some other participants argued that there is the capacity within Ghana to offer the needed education and training. The latter view was dominant amongst study participants.

The type or form the education and training for extended practice should take generated two main divergent views. The first view was that the education should be at the postgraduate level, organised by the institutions of higher learning. The second view was that the education should be a 'professional' education which is hands on, radiographers undertaking it should be placed with various radiologists who would act as their mentors. At a point when the mentors were satisfied with the output of the radiographers they would then be certified as qualified to practice.

Some participants advocated for a review of current curricula to ensure radiography education offered in Ghana is fit for role extension. Those who held this view argued for more emphasis on image interpretation as a fundamental of the basic job, so that radiographers at registration would be qualified to provide initial comments on all radiographs they produce. Other participants recognised the need for a completely new curriculum developed specifically for extended roles and argued that this should be at postgraduate level. This (novel) qualification would qualify practitioners to provide written reports for radiographs.

However, some participants, mostly radiographers and radiologists in higher education, argued that the current curriculum being used is robust and compares to any such curriculum around the world.

In addition, the entry requirement into the programme for extended practice was explored in this chapter, most participants argued that it was important to make prior clinical practice experience a requirement for entry. The duration of the programme generated various responses ranging from six months to five years. Most participants argued that a two-year programme would be ideal.

A wide range of health professionals were suggested as appropriate to be involved in the education and training process. These professionals included radiographers with the requisite qualifications, radiologists, anatomists, physiologists and lawyers.

How to determine the competence of participants in the programme was explored and the consensus was that this should be by examination, this would include both clinical and theory elements. Participants also argued that the pass mark for these examinations should be high to ensure that standards were maintained. They suggested marks between seventy and eighty percent.

The third and final results chapter will explore policy planning and implementation of role extension in diagnostic radiography. It explores what the right ingredients of a good policy should be; regulation, what should be regulated and who should be the regulator. Sanctions that should be applied to offenders are also explored.

## Chapter Seven

### Policy formulation and implementation

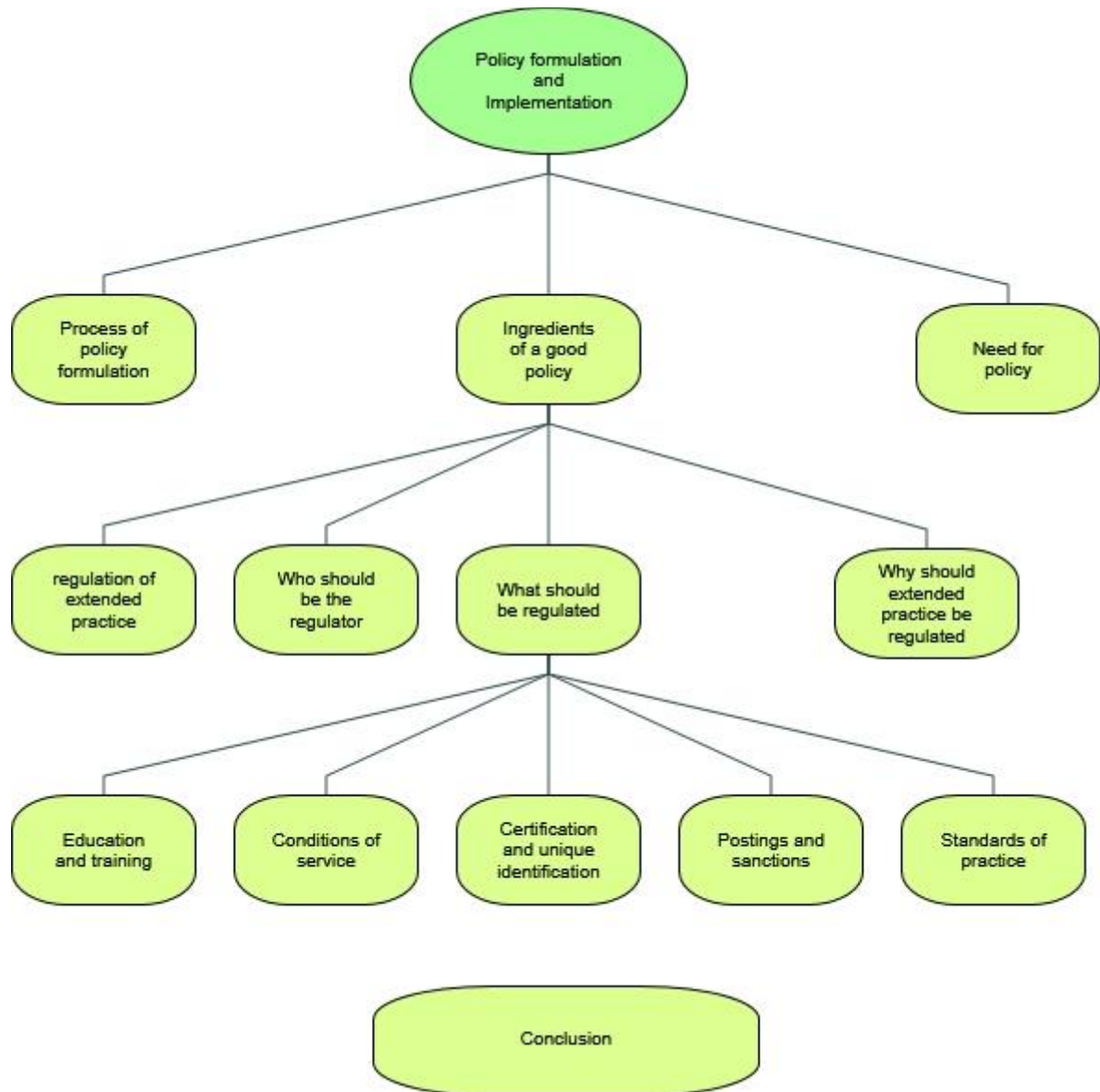


Figure 7.1 Schematic diagram on policy planning and implementation for role extension

Figure 7.1 is a diagrammatic presentation of the theme on policy planning and implementation. This theme is discussed under three subthemes. The process of policy formulation which explores the stages that policy formulation should go through

according to the participants. The second subtheme explores the need for policy formulation and last subtheme considers the ingredients of a good policy. This subtheme is discussed under various headings including regulation of extended practice, who should be the regulator, what should be regulated and why it is important to regulate extended practice. The suggested list of items that should be regulated include; education and training, conditions of service, standards of practice, postings and sanctions and unique identification and certification.

## 7.1 Introduction

This chapter discusses policy formulation and the successful implementation of role extension in diagnostic radiography. It identifies the importance of having a policy to guide the successful implementation of role extension in diagnostic radiography and considers the processes that policy formulation should go through to ensure the final product is feasible, thus minimising the likelihood of implementation failure.

Some of the ingredients of a good policy, as proposed by the participants, include the need for regulation of extended practice, who should be responsible for the regulation and what should be regulated. The chapter concludes with a summary of what has been presented in the chapter.

## 7.2 Need for policy

A policy will need to be formulated in order to guide the introduction of a major shift in the way in which any service is delivered, especially when fundamentally changing the way in which things have been done for many years. Therefore, diagnostic radiography

will require a policy that seeks to guide the introduction of an initiative such as role extension.

Most participants, across all professions, argued that role extension in diagnostic radiography, although a common practice in the UK and other advanced countries, is a new and unregulated area in Ghana. Its introduction in Ghana will therefore require the formulation and implementation of a policy to guide and regulate how role extension should be practised. They argued that the policy ideally should guide practice and should also provide the framework through which practice is conducted.

The majority of participants argued that a policy directive issued by government would not only regulate practice but would also confer greater legitimacy than if it were from a professional association such as the GSR. The principal reason for the introduction of role extension in diagnostic radiography across the world, has been the shortage of radiologists and government policy which aims to improve healthcare and technological advancement. Patient welfare and benefits have always been a central consideration in countries which have introduced role extension.

Some participants, across all professions and sites of the study, believed that a strong case could be made for both patient benefits and financial savings resulting from role extension in diagnostic radiography. They argued that given that Ghana is a developing country and has competing demands for scarce resources, any policy that reduces staffing cost without compromising the healthcare of patients is likely to be given favourable consideration by policy makers.

Supporting the need for a policy originating from government, one radiologist contended that successful programmes in other areas of healthcare were championed by the MoH and GHS, so this should not be any different. He also argued that roles have been extended in other professions within the healthcare sector in Ghana, as such it should not be a difficult to achieve the same result in radiology:

*That policy has to be spear headed by the ministry of health, you see it is the ministry of health or Ghana health service, they have to spear head that. The university I do not think is in a position to do that. It is Ghana Health Service that should do that to boost the capacity of their human resource. Elsewhere, at least in the US, there is a programme that they call radiologists assistant, like how we have physician assistants so that areas that doctors are not there we have trained nurses who will be able to give prescriptions, that programme was carried out by the GHS and MoH, so they have to come up with a programme like the radiologists assistant so that at least all the district and regional hospitals can be covered. (Interview PA8 Page 6)*

In addition, to effectively deal with possible opposition from radiologists, there is the need for a policy from government introducing and regulating role extension in diagnostic radiography. It is only natural for radiologists to seek to protect what they view as their professional territory:

*For us to overcome this barrier of trying to protect their territory then we should fight for a legal backing (policy) from government which will*

*give us the mandate to extend our roles. Otherwise, they will continue to protect their territory (Interview PT4 Page 8).*

One radiologist argued that role extension in diagnostic radiography would be good for the healthcare system in Ghana, especially in the rural areas where the services of radiologists and sometimes medical officers are not always available, however he insisted that there must be a policy backing its introduction. He further argued that there was a need for the skills of radiographers to be improved to enable them to extend their roles. This he argued would benefit the patients, especially given the rather small number of radiologists in the country:

*It is about policy and if this is going to happen in Ghana, we need a whole policy statement on it, but it won't be a bad idea if skills of radiographers can be enhanced to take care of those areas (Interview PT 1 Page 9)*

He further underlined the fact that the introduction of role extension will help improve upon the quality of services patients receive in the country. He also argued that to ensure that the desired results from the introduction of role extension are attained, a policy is needed to guide the whole process. He further contends that the whole process of policy formulation and introduction has to be done in the right way. The only way that the desired benefits will accrue to the patients is by ensuring that the right things are done. This view was common amongst most radiologists and radiographer participants. The need to do things the right way was of prime importance:

*If role extension has to be introduced in Ghana, because your study is talking about Ghana, it is a good thing, it may help, it will help but it has*

*to be a policy and has to be done the right way for the desired benefits  
to be derived from it. I think it is good (Interview PT1 Page 11).*

Most participants from all professions and sites of the study argued for the need to have a policy that will guide and regulate the practice of extended roles in diagnostic radiography. The reasons for the need of a policy have ranged from reducing or eliminating possible resistance from radiologists, ensuring that the practice is regulated and practised within boundaries and importantly to ensure that the purposes for which roles are extended is achieved without lowering the standard of care to clients.

### 7.3 Process of policy formulation

Participants have suggested that the process of policy formation is very important as it will inform the type of policy which needs to be formulated and will also, to a large extent, determine whether the policy is successful or not. They further argued that if the process of policy formulation includes a significant amount of consultation, involving all the key stakeholders in the radiology sector, then the policy stands a better chance of success. The level of involvement of the stakeholders will also determine whether the policy is likely to be widely accepted or not by some sections. There is therefore a need for broad consultation and consensus building, this will assist with stakeholder ownership of the policy.

Most radiographer participants anticipated that radiologists would feel that their 'territory' has been invaded and, as such, there is a likelihood of professional resistance from them. They argued that; radiologists are likely to resist the introduction of role extension in order to protect their professional territory.



*By the specialist, I mean radiologists, they will feel their work is being taken away from them and the issue of territory will come to play (interview PW1 Page 13).*

There is a strong possibility that radiologists would resist the introduction of role extension in diagnostic radiography in Ghana, given that they have resisted radiographers performing ultrasound examinations in the past. Some radiologists, however, have argued that sonography should be within the scope of radiographers once they have the requisite education. Participants added that if radiographers extend their roles then the workload on radiologists would be reduced which would allow them to specialise in more complex and time-consuming modalities and examinations. The patient should be at the centre of the decision on whether to allow radiographers to extend their roles, but to some of the radiologists it is more about power and protecting their professional space they added:

*They will not agree that radiographers are allowed to go into such territories, it happened with ultrasound but now we are doing it everywhere, some radiologists have recognized that they don't see the reason why they should be sitting down on an ultrasound and be scanning when a radiographer is good in doing that so that they can do other things. Just some few ones or some of them who don't understand how things are moving, fearing their own shadows, they are haunted by their own shadows that if we allow these guys to do this then they will be like us, forgetting that it is the patient we are all thinking about and not our individual positions or professions in which we are, because the whole thing is teamwork (Interview PA6 Page 8).*

Some participants suggested approaches to deal with the potential resistance from the radiologists' right from the policy formulation stage. One radiographer suggested that the involvement of radiologists from the onset of the policy formulation process might help to forestall any possible resistance from them.

*If they are involved in the process, they are likely to understand and cooperate (Interview PWI Page 13).*

Furthermore, it was argued that radiologists would inevitably be involved in the education of radiographers who would extend their roles as part of the introduction of role extension. It is therefore important to involve them in the planning stage. If they are involved in the planning stages and in forming the governance structures of role extension in diagnostic radiography, they are more likely to be responsive to its introduction. Their fears would be addressed in the process and they would feel a sense of ownership of the process and thus more likely to be committed to its successful implementation:

*We will need to consult them because we will need their help also in some of the training modules, once they are coming on board as trainers then we will need to consult them from the very first day. Right from the consultation stages where they get to formulate the whole programme, we can get them on board in the various committees that will work in formulating the programme structure and all of that and within the programmes governance structure you create roles for them to occupy, that way they will not feel left out or threatened, they will feel a part of*

*the programme from the very onset until completion (interview PA5  
Page 10).*

One radiographer suggested that education and sensitisation is important as it is only natural for human beings to resist change until it becomes obvious that change will be beneficial to them and to society. The need to emphasise the benefits of the change to the patients, who should be central to healthcare, is paramount as this has a tendency to influence policy makers. Patient welfare should be at the heart of all healthcare related policies and this should not be an exception. He added that there is currently some animosity between radiographers and radiologists so there will be a need for sensitivity, otherwise there could be suspicion from the radiologists as to the real intention of the policy. Sensitisation will seek to explain the policy of allowing diagnostic radiographers to extend their roles and espouse the benefits that patients will derive if this policy is introduced. It will also explain the possible economic implications resulting from savings that would be made by introducing role extension in diagnostic radiography and the possible use of resources accruing from savings made. The sensitisation should also include creating awareness amongst radiologists that role extension will reduce the workload on them, thereby creating space for them to concentrate on other more complex duties and to further specialise:

*I think there should be sensitisation because as it stands it looks like there is some kind of friction between radiographers and radiologists, so that the radiologists for example do not feel that we are taking over their jobs. So, they know that it is not as if we want to take over their jobs, it is just that we want to develop ourselves and we also know that the*

*workload is a lot for them so that will be my advice (Interview PA 1 Page 4)*

Additionally, the councils of the various professional bodies should be engaged in the development of the policy so that the potential for conflict is reduced or eliminated. It is usually easier for leadership from both sides to have a dialogue, arrive at a decision, and communicate the way forward to membership. The leadership of the various professional bodies can thus be invited to make input to the policy by either the MoH or the GHS. Most radiographers shared the view that once the professional bodies agreed to it, all its members will follow suit:

*We work with them in the department, they are our partners we can by way of our council and their council they can sit down together and formulate a policy that is going to help the two professional groups to work in a manner that will not bring any conflict (Interview PW2 Page 10).*

The important role of broad consultation is articulated by the Minister of Health in a letter inviting various stakeholders in the healthcare sector to make input for possible amendment of the Teaching Hospitals ACT 525 1996. The letter states in part:

*Following broad consultation and intensive review of ACT 525, it has become obvious that the ACT 525, which has been implemented for well over 20 years be amended.*

*I am by this letter, requesting all stakeholders to submit inputs for the suggested amendment by (date given). Kindly treat as urgent.*

The attached distribution list of this letter had 37 different stakeholders; this is indicative of the fact that for a policy to be successful, all the stakeholders must be involved in the planning stage. The letter also indicates the importance of the broad consultation which took place before policy formulation to enhance its chances of success.

Lastly, a radiographer argued that, even though dialogue with the radiologists is of paramount importance, radiographers would need to present to the radiologists some data or facts that support role extension within the Ghanaian context. It would not be prudent to rely solely on research from the developed world without including any local research. He contends that supporting data from the Ghanaian context is essential in order to strengthen the case and to make it convincingly for policy makers. The current study will serve as a key piece of research work regarding the Ghanaian context. It is also important to provide government with evidence that role extension in diagnostic radiography will be beneficial to patients' welfare and has the additional benefit of potential financial savings resulting from its implementation:

*I see the possibility of winning them over in dialogue but it should go with some information, if you go to meet them and you don't have the statistics or the research backing that this is what is happening, you are citing cases in the UK and USA but you don't have the statistics within your own country, I don't see how you are going to make that argument to be fruitful on your part. I think we could win that dialogue if perhaps we get some information or research backing then sit with them and dialogue. I think that will be the best (Interview PT4 Page 10).*

A common theme was the need for involvement of the various stakeholders, especially radiographers and radiologists, in the policy formulation and implementation. This would be required to ensure that possible resistance from any of the professional bodies is, as much as possible, addressed at the policy formulation stage. Indeed most participants, across all the professions and sites, believed that the involvement of stakeholders was key to successful policy planning and implementation. The researcher, being a radiographer by profession, and having gained experience throughout the period of this research could play a role in the policy formulation and implementation.

#### 7.4 Ingredients of a good policy

Views expressed by participants, on what would constitute the vital ingredients of a good policy on role extension in diagnostic radiography, are varied. Participants argued that, the ingredients vital in a good policy include the regulation of extended practice, who should regulate role extension, what should be regulated and why role extension should be regulated.

##### 7.4.1 Regulation of Extended Practice

Agreement on the need for regulation of extended practice has been unanimous across all sites and professions, the question of who should be the regulator of extended practice however generated divergent views. There is also unanimity on the reason why extended practice should be regulated. Various reasons have been adduced by participants on why it should be regulated, who should be the regulator and what should be regulated. These are presented below in the following order, who should be the regulator, what should be regulated and finally why should extended roles be regulated.

#### *7.4.1.1 Who should regulate Extended Practice in Ghana?*

Two broad views were expressed by the majority of participants as to whom should be responsible for the regulation of extended practice. There were however other views expressed by a few participants which were not particularly popular amongst the other participants. These views are presented below.

The most popular view expressed (mostly) by radiographer participants across all sites was that the AHPC, which is the regulator of practice of allied health professionals, should be responsible for regulating extended practice. They argued that radiographers are already regulated by the AHPC and as such, it is only reasonable to allow it to regulate extended practice:

*We should have the AHPC regulating it because as a radiographer in Ghana you are regulated by the council (Interview PA4 page 5).*

There is a precedent in other professions in the healthcare sector in Ghana regarding the way in which regulation was introduced. There is therefore no need to re-invent the wheel. One radiographer argued that these professions have used their various councils to regulate practice, so the AHPC is best placed to regulate extended practice in radiography. One participant argued that the AHPC should regulate the practice of radiographers who have extended their role and their education:

*I think looking at the structure put in place by the nurses and midwifery council and the pharmacy council, they have been able to put in place programmes like fellowships for their members. I think we can adopt*

*that same structure whereby the Allied Health Professions Council (AHPC) will have to sanction and regulate the programme. (Interview PT3 Page 6).*

In contrast, one radiographer argued that the GSR could regulate extended practice by establishing a College of Radiographers (CoR) to do so on its behalf. He further contends that it has worked in some countries such as the UK and could work in Ghana as well. The society of radiographers could set up a College of Radiographers which would be responsible for education and for regulating role extension:

*It should be regulated. I think the society of radiographers can do that and for the society, we can establish what we call the college under the society. Some places they have the college of pharmacist and college of nursing or so. We can have college of radiographers which can also oversee the activities of this training and empowering people to go into role extension, for instance if it is image reporting we can have a branch of the college dealing with image reporting and we can have other branches looking at other parts of role extension so that it is regulated (Interview PA5 Page 5).*

Some participants argued that stakeholders such as the MoH, National Council for Tertiary Education (NCTE), the professional bodies and the AHPC through collaboration and consultation, could develop a regulatory framework and agree who would be responsible for implementation:



*When you talk about regulation of practice it is the professional body, the regulator, that is the council, then the MoH and then NCTE (National Council for Tertiary Education), they should do it (Interview PA 4 Page 5)*

In contrast one medical officer surmised that the Medical and Dental Council (MDC) in Ghana has regulated the practice of nurses and other health professionals that have extended their roles into areas that were previously within the domain of medical officers. As such the MDC could very easily be equipped so that it could regulate extended practice in radiology. He argued that when the roles are to be extended into areas that were previously regulated by the MDC, the council should still be responsible for regulating the practice of those roles even though the new practitioners are neither medical officers nor dentists. This view was popular amongst the medical officer participants of the study:

*There is the medical and dental council that works normally, and they have kept an overview of the activities of the physicians' assistants, anaesthesia and dental assistants or anaesthesiologists, I just think we need a part of which that should involve radiologists and radiographers. It should not be that difficult if you have a setup it comes with the training. I think the medical and dental council can be equipped to do the regulation (Interview PT2 Page 5).*

Similarly, one radiographer in arguing that the MDC should be the body that regulates extended practice, contends that extended roles will be outside the jurisdiction of the AHPC and within the purview of the MDC. He therefore contends that the MDC is best placed to regulate extended practice. He cites precedence within the healthcare sector

in Ghana to support his claim. Any other radiographic practice that does not fall within the extended roles will still be regulated by the AHPC he added:

*Extended roles are beyond APHC, it enters the mainstream Medical and Dental Council (MDC) jurisdiction, so probably just like they did with the physician assistants who were nurses and then qualified as physician assistants. We can actually migrate the extended roles to the MDC where they will be monitored and licensed. Beyond that any other radiographer without an extended role can stay with the AHPC because that is where it comes under (Interview PA5 Page 6).*

One participant introduced an idea of the ways in which extended practice could be regulated which was substantially different from the previous suggestions. He proposed that it should be regulated by the use of special interest groups. He contends that if this was done, it would make regulation effective because each group would have a particular specialised area that they were responsible for and as such, the possibility of effectively regulating the area would be high. He argued that it should be regulated by specialty, in other words all CT examinations should be regulated by a special group of CT experts and all general radiography procedures should be regulated by a group of musculo-skeletal experts. He further stresses the importance of continuous monitoring:

*It should be a specialised unit, if you are specialising in HSG procedure it should have a specialised group regulating it and if you are specialising in reporting it should have a specialised unit regulating it. They should be controlling and monitoring it (Interview PW1 Page 10).*

The draft legislative instrument for Act 857 (2013) proposes two levels of registration. The first level being mandatory and the second level being voluntary. The mandatory registration has to be done with the AHPC; this is a statutory requirement for one to be able to practice as a reporting radiographer. It also stipulates that if prior to extending their roles radiographers were registered as general practitioners, they will be required to register as reporting radiographers upon completion of education to extend their roles. The legislative instrument also requires anyone intending to practice as a reporting radiographer to register with the AHPC. It also seeks to establish a College of Radiographers which will be responsible for standards of practice amongst other things. The relevant portions of the document states:

*There shall be a College of Radiographers instituted with the coming into force of the Health Professions Regulatory Bodies Act, 2013 (ACT 857) and its supporting legislative instrument. The College will seek among others, to;*

*i. Develop and expand the scope of professional practice guidance for practitioners*

*ii. Develop specialization pathways for practitioners*

*iii. Shall maintain a national register of Sonographers, reporting Radiographers, Assessors and Advisors.*

*iv. Award consultant status on Radiographers who have fulfilled the required training formats.*

*v. Set up committees for the monitoring professional practice*

The draft legislative instrument setting out a college of radiography seeks to, amongst other things, issue guidelines for extended practice, monitor professional practice to maintain the standards of practice, set out centres of excellence and to keep a register of all those professionals who are qualified to practice as advanced practitioners. The college will also be responsible for pathways which lead to radiographers specialising in some areas of practice. The draft legislative instrument envisages the AHPC as the regulator of extended practice in Ghana.

*7.4.1.2 What should be regulated?*

All participants agreed that extended roles should be regulated, however participants' views on exactly what should be regulated in extended practice were varied. The areas suggested for regulation included education and training, remuneration and conditions of service, certification and unique identification, postings and scope of practice and standards of practice. A number of justifications were given for the need to regulate the various areas suggested and these are presented below.

**7.4.1.2.1 Education and training**

Education and training are a critical part of any professional practice. Education must be regulated to ensure that the standards required to produce qualified personnel for role extension are maintained. Education and training were discussed in detail in the previous chapter. It is however discussed here with respect to the need for it to be regulated.

There is some degree of suspicion between radiographers and radiologists on the issue of extended roles. The suspicion between radiographers and radiologists is evident in the

response of a radiographer who argued that a legal regime is needed, this would govern the education of radiographers for extended roles. Without a legal framework in place, there is the likelihood that radiologists may resist it. The issue of professional boundaries and seeking to protect one's professional territory was raised. This comment is similar to many others from radiographer participants:

*We should fight for a legal backing which will give us the mandate to do that training (Interview PT4 page 8).*

Moreover, the draft legislative instrument for Act 857 (2013) provides the basic education required by a practitioner to become a reporting radiographer. The document reiterates the need to educate professionals to meet international standards of practice to enable them to offer the desired services to patients. The very fact that education and training is captured in the draft legislative instrument is strong indication of the need to regulate education. The document states that, amongst other conditions, the minimum qualification for extended roles should be:

*A postgraduate certificate (PgC) or postgraduate diploma (PgD) or MSc that has been accredited internationally or locally by the National Accreditation Board, Allied Health Professions Council and the College of Radiographers. Education provision at this level is required to take cognizance of postgraduate outcomes as identified internationally by the World Health Organization.*

Participants have argued that because of the important role that education and training plays in the competence of practitioners, it should be regulated, and stringent targets set. These targets would need to be met before one can duly be deemed as fully qualified to

extend their role. Thankfully, the draft legislative instrument for Act 857 (2013) is very extensive in how education and training should be regulated and controlled.

#### 7.4.1.2.2 Remuneration and conditions of service for extended roles

Remuneration for practitioners who extend their roles is of concern, mainly to the participants who are radiographers. They argued that if the policy does not include rules on where radiographers, who extend their roles, are placed on the salary structure; it is very likely to create problems and could end up serving as a disincentive for radiographers choosing to extend their roles. One radiographer further argued that other healthcare professionals, such as the pharmacists and doctors who specialise, have regulations guiding their placement and as such radiographers should not be treated differently. The salary structure on which healthcare professionals are currently placed has placement for specialist medical officers, specialist nurses and pharmacists but not for radiographers. Consequently, any radiographer that undergoes postgraduate studies is better placed in higher education than in clinical practice. This has resulted in highly educated and experienced radiographers leaving the clinical area for higher education. He added that a parallel structure for remuneration should be developed for practitioners who have extended their roles:

*I will think that if the person goes into a speciality then I think a different category should be drawn that will indicate that this one is a specialised one because now we have it as Radiographer, senior radiographer, principal radiographer, assistant chief radiographer and chief radiographer and then when you get to chief that is all but I know with the pharmacist and the doctors they have a lot of grades within so*

*maybe we can have some like consultant radiographer (Interview PW2*

*Page 6)*

Additionally, in reviewing a document on the various grades of professions in the health sector and their placement on the salary structure entitled single spine salary structure as at January 2018 by category and grade. A list of the various grades for radiographers are: radiographer, senior radiographer, principal radiographer, deputy chief radiographer and chief radiographer. Whereas for the pharmacist the grades provided are pharmacist, senior pharmacist, and principal pharmacist, deputy director of pharmaceutical services, chief pharmacist, specialist pharmacist, senior specialist pharmacist and consultant pharmacist. The various grades for the medical officers in the same document are house officer, senior house officer, medical officer, senior medical officer, principal medical officer, deputy chief medical officer, chief medical officer, specialist, senior specialist and consultant. The document clearly makes provisions for the category of specialist, senior specialist and consultants in the case of medical officers and pharmacist but not for radiographers. Participants have argued that in order for role extension to be successful there would be a need for the policy, guiding the introduction and implementation of role extension in diagnostic radiography, to make provision for specialist, senior specialist and consultants. Especially given that the college of radiographers aims to train specialists and will have the power to confer the category of consultant radiographers (based on a well outlined criteria stated in the draft legislative instrument of ACT 857). They further argued that anything short of these additional categories would be likely to have a negative effect on the introduction of role extension in Ghana.

Another issue of concern for most radiographer participants was the conditions of service that would be attached to the position, if they chose to extend their roles. They contend that the regulations governing the policy should determine the conditions of service for radiographers who extend their roles, this should take place beforehand to avoid any ambiguity on conditions of service.

*Another important thing which needs to be improved in Ghana is the placement system on the salary structure. After those who have completed or gone on further studies to specialize there is the need for the system to have place for them as far as conditions of service is concerned (Interview PT4 Page 10).*

The concern by participants, that conditions of service for practitioners extending their roles should be agreed beforehand and covered in the policy document, is based on experiences with government. One document from the Minister of Health dated 30<sup>th</sup> July 2018 and entitled: Implementation of signed conditions of service for health workers, reads in part:

*You will recall that in 2015, the government of Ghana through the Fair Wages and Salary Commission agreed and signed conditions of service document with the following health workers unions.*

*The Ghana medical association*

*The Ghana Nursing and Midwifery association*

*The Health Services Workers Union*



*The government and hospital pharmacist association.*

*The Ministry of Health is by this letter requesting all health agencies to comply and implement the signed conditions of service.*

Conditions of service agreed and signed with the government in 2015 had not been implemented three clear years later and after several agitations. The main concern is that if signed conditions of service take this long to implement, what will be the situation if these conditions of service are not agreed and signed before the commencement of role extension.

#### **7.4.1.2.3 Certification and Unique identification of extended practice**

There is a need to ensure that only qualified and certified personnel are allowed to extend their roles. To ensure that this happens, it is important to issue certificates and unique forms of identification for all practitioners qualified to practice in extended roles.

One medical officer suggested that all radiographers who have extended their role should be identified uniquely and given stamps that they must apply to whatever work they have done. This will help in making regulation easier. He further contends that these stamps should have all the details of the practitioner, which should include their specialty. He explains that electronic reports should carry the practitioners' electronic signature and unique PIN number:

*We can register all the radiographers who are trained, they are given PIN (personal identification numbers), and they are given particular stamps that identifies them. So, each radiograph that is reported is signed and endorsed by the said radiographer. So, you are able to*

*identify who does it and who does not. That way not anybody will be able to report anything (Interview PA7 Page 4).*

Similarly, one radiographer reiterated the need for radiographers who have extended their roles to be certified, this certification should indicate which area the radiographer has been certified to extend his or her role into, to forestall the issue of uncertified radiographers extending their roles by going into such areas.

*Any person who has been licensed to extended their role, should be certified, this person should be given a certificate and be recognised that this person is ABC and can take XYZ roles, it should be certified otherwise everybody will say I am a radiographer I have the right to do QRS meanwhile you don't have the training or competence (Interview PA3 Page 7).*

Most participants argued that not only should practitioners who have extended their roles be given certificates after completion of their education and training, these certificates should be displayed at the place of work. They further argued that the certificates should also indicate in which areas the practitioner is allowed to practice. In other words, the certificate should indicate the scope of practice of that practitioner.

#### **7.4.1.2.4 Postings and Sanctions**

The majority of radiologists In Ghana are located in the two largest cities, Accra the capital city and Kumasi the second largest city. This means that some of the regional and almost all the district hospitals are without the services of radiologists. Most participants have opined that the services of radiographers, who have extended their roles, will be in

greater demand in places without radiologists. They therefore contend that it would be more beneficial to the country if such radiographers were posted to the district hospitals where their services would be in greater demand. They further argued that there is likely to be little or no resistance from the radiologists if the radiographers are posted to these district hospitals, since the radiologists do not accept posting to these facilities. They therefore concluded that it would be advantageous if the policy were to regulate where radiographers, who have extended their roles, are to practice so that it reduces the possibility of conflict with the radiologists:

*We can start by not putting the radiographers in a conflict situation, in that we start by posting them to places where there are no radiologists like the district hospitals or the smaller clinics where the radiologists will typically not want to go. Once we post them there they would not have issues because their target will be the main cities (Interview PA5 Page 9)*

It was further argued that guidelines and standard operating procedures should spell out who is allowed to perform which procedure and how it should be done. There should also be sanctions for anyone that acts contrary to the laid down protocols. One participant contended that with guidelines and possible sanctions that could be applied if anyone failed to adhere to the guidelines, there is a likelihood that, to a large extent, practitioners would obey them. This will ensure that the quality of services provided will be optimum. He further argued that because there will be consequences for deviating from the rules, practitioners will as much as possible try to adhere to those rules and guidelines. He also advocated that the severity of the punishment should be determined by the severity of

the violation. He added that these punitive sanctions should be deterrent enough so that practitioners will not violate them wantonly:

*There should be sanctions, for instance, there should be guidelines and standard operating procedures, if you are found guilty of going contrary to the guidelines or the standard operating procedures, they should apply the sanctions. The sanctions can be in any form from demotion, suspension and even withdrawal of license to practice depending on the severity of the offence that you have committed (Interview PA8 Page 6).*

#### 7.4.1.2.5 Scope of practice

Two contrasting arguments have been made with regard to the scope of practice. The majority of participants across all professions and all sites, argued that there is a need for a scope of practice which is limited to a particular area of speciality, however there is a second opinion which is opposed to this view.

Most participants argued that regulation should cover the scope within which radiographers will practice when extending their roles. They argued that with regulation limiting the scope, it would ensure that there was division of labour and a number of specialties that radiographers could choose to specialise in. It was emphasised that radiographers who extend their roles do not become jack-of-all-trades and master of none. A participant argued that the scope of practice should be regulated, this would ensure that practitioners do not practice beyond their competence:

*I think it should be based on speciality so that we will have radiographers who are only into say chest reporting, others the appendicular or axial*

*and maybe others on skull. Some may also go into head CT reporting and we make progress from there. (Interview PW2 Page 6).*

Additionally, it was argued that extended roles do not make a radiographer become a radiologist and as such, there was a need to regulate the scope within which they can practise. This would ensure that each practitioner would know the limit within which they are allowed to practise:

*The fact that a radiographer has extended his role in reporting does not make the radiographer a radiologist, so in regulating such roles, we have to state the depth in which they can go and the extent to which they can go (Interview PA5 Page 6).*

The draft legislative instrument for Act 857 (2013) stipulates that the scope of practice for reporting radiographers should be regulated. The document captures the scope within which reporting radiographers should be allowed to practise. It states in part:

*Specific qualification will limit the practitioner to the competence level at which the practitioner can operate.*

The draft legislative instrument for ACT 857 makes provision for a College of Radiographers to be set up, this would provide routes which radiographers seeking to extend their roles could use in order to become specialists. This means that the document is geared towards extended practice being within a limited scope. The relevant portion of the document states that the college of radiographers would:

*Develop specialization pathways for practitioners*

Furthermore, radiologists who argued in support of having a limited scope of practice, contend that considering the very education that radiographers receive and the fact that radiographers do not have what he calls 'clinical experience' in medicine will make it impossible for radiographers to extend their roles to cover all areas of practice. He further argued that the education received by radiographers might not be sufficient to allow them to extend their roles in order to cover all areas, hence the need for a limited scope:

*To do reporting of head CT then you do that because really to do all the things it becomes difficult from the background where a radiographer is coming from, I know radiographers do anatomy but the kind of anatomy they do may not afford you all the things and the clinical bit of the study is where the difficulty is, even the anatomy is not the bigger problem even though it is a problem but the clinical aspect of the imaging is where the problem is. It really takes a lot of clinical experience from the clinics and the clinical studies to be able to impact that in image interpretation (Interview PT1 Page 11).*

He further contends that for radiographers to be educated to cover all areas or specialities, the duration of the course would have to be lengthy and it would take the radiographers away from their stations for a long period. His reason being that as a medical officer he spent an additional four years being trained as a radiologist. A radiographer who does not have a medical background would require a much longer period of training if the radiographers were to cover the full range of issues presently covered by a radiologist. He thus advocates for a limited scope of practice for extended roles:

*The number of years will be too much, because even after my clinical practice after passing out as a medical officer I had to do four years for radiology so if you want to do radiography and come, if I give you four years you will still have problems, so a limited scope is very important (Interview PT1 Page 11).*

He also claims if the duration is too long, because there is an attempt to cover all the specialities of radiology, then it might end up serving as a disincentive for radiographers. However, if the duration is short, radiographers will want to undertake the education and quickly return to their facilities to practise in extended roles in order to help deliver quality healthcare. He explained that the duration, if too long, could also serve as a barrier in that employers might not be willing to release or give permission for radiographers to undertake further education so that they can extend their roles. Employers are more likely to be willing to allow their employees to undertake further education to extend their roles if the duration is short:

*Expanding your scope too much and the period might be too long, people might not like to go and keep themselves studying for the next five or six years just to come and interpret images. They may have difficulties. I think if the scope is limited then the incentive will be there for people to go and do it quickly and come back and help (interview PT1 Page 11).*

Similarly, a radiographer in higher education argued that it would be quite difficult to find a radiographer who is able to develop expertise in all the areas of radiology and who is

also able to practise satisfactorily. He therefore suggested that it was more practicable to have a limited scope within which radiographers can extend their roles:

*It will be difficult to have a radiographer who is knowledgeable in trauma, image interpretation, CT, MRI and other things (interview PA6 Page 6).*

Some participants also argued that the scope should be limited because, it is essential that radiographers are allowed to specialise in particular areas. They contend that this will ensure they acquire in-depth knowledge of whichever areas they choose to specialise in and that this will result in the delivery of quality healthcare services to clients. This is a view held by most participants from all professional groups and across all the sites used for this study. A radiographer sums it up:

*I will say it should be specific sub-specialties, if you say you want to be a musculo-skeletal radiographer then you should just stick to it so that the person can be able to build the competency in that one particular area. So, people should just be pinned to one particular area they want to practice in (Interview PT3 Page 5).*

Similarly, a radiographer in support of the need to have specialities argued that, specialities should be based upon need and relevance to the local situation in the country. He contends that some examinations are very common in radiology departments throughout the country, so it would make sense to consider them if specialities are being developed for image interpretation for example.



*I think there should be some specialty for at least head CT reporting since in any CT scan unit head is usually the most common. I think head CT reporting sub-specialty will be very important in addition to the appendicular and the thorax (Interview PT4 Page 6).*

It was suggested that for role extension to be a success in Ghana, it would need to be introduced gradually and to start from simple procedures that are unlikely to be contentious. This way the capacity can be developed gradually and move on to more complex procedures as the requisite capacity and confidence develops. It is also important that when introducing role extension in diagnostic radiography, efforts are made to avoid any situation of conflict with key stakeholders. They believed a gradualist approach is the best way forward:

*If we are starting role extension it should be done gradually, from one step to another. We can start from basic radiography, we can start from chest X-rays, what are some of the criteria that are used in assessing that this is a quality image, then you go into pathology, differentiating between normal and abnormal. So, we can start from general radiography so that gradually we go into CT scans, we should be able to differentiate between a bleed and an infarct on a CT scan (Interview PA3 Page 6).*

When role extension has been successfully implemented in the UK it has, to a large extent, limited the scope within which the practitioners practise. One radiographer argued that anywhere where there has been successful implementation of role extension, there has

always been a related scope of practice. It is therefore important to learn from best practice elsewhere and to adapt it to suit the local needs of the country if necessary:

*There should be a scope, even in the UK when they started and even to date there is scope. So, you will see some radiographers in MRI image interpretation, even in some places it could be some specific areas of the body, because if you look at the way imaging is, it is very extensive (Interview PA6 Page 6).*

The draft legislative instrument for Act 857 makes provision for the establishment of the College of Radiographers, Ghana, which will supervise and regulate role extension in radiography in conjunction with the AHPC when passed by parliament. The college will also, among other things, be responsible for the education of radiographers who are extending their roles.

The draft legislative instrument is quite extensive and covers all sectors of role extension. It defines reporting radiographers as:

*“Healthcare Professionals, who are Radiographers with the appropriate training, who specialize in the interpretation of radiographs, are competent to identify pathologies and anomalies, and can independently produce reports and diagnosis based on the radiographs being reported”. It further adds that “reporting radiographers are autonomous practitioners who perform with high levels of accountability and responsibility. They exercise critical judgement and skills to ensure the efficient, effective and safe delivery of reporting*

*services, taking responsibility for the conduct, assessment and reporting of various images”.*

As per the definition above, reporting radiographers can therefore be viewed in the same way as radiographers who have extended roles. The document also states what the scope of practice of a reporting radiographer should cover:

*“The normal scope of practice for reporting radiographers includes at least one and usually more of the following fields (each of which are in themselves wide ranging in scope):*

- i. Plain Radiographs of Appendicular Skeleton*
- ii. Plain Radiographs of Axial Skeleton*
- iii. Plain Radiographs of Adult Chest and Abdomen*
- iv. Computed Tomography Scan of Head and Facial Bones*
- v. Magnetic Resonance Imaging Scan for General Investigations*
- vi. Magnetic Resonance Imaging Scan for Head and Cervical Spine*
- vii. Intravenous Contrast enhanced special radiographic examinations*
- viii. Gastrointestinal Tract contrast enhanced special examinations “*

From the foregoing it can be argued that the legislative instrument outlines a scope within which radiographers, who have extended their roles, can practise. The point is actually made that the above listed sub-specialities in themselves are quite broad, this makes a case for extended roles having a limited scope within which to practise. The draft

legislative instrument clearly outlines the scope of practice of, what it refers to as, a reporting radiographer.

The majority of radiographers and radiologist participants were of the view that extended practice should have a limited scope. They argued that it would lead to specialisation, which would be to the benefit of the patient. The majority of the medical officers interviewed felt that the education for radiographers extending their roles should be tailored towards specific local needs.

In contrast, two participants were of the view that there is no value in limiting the scope. They contend that it will not be beneficial to have a limited scope as one radiologist who supports this view argued that if role extension in diagnostic radiography is to be implemented, it should be done fully otherwise the benefits to the community will be limited. He does not support specialisation and limiting of scope within role extension:

*I don't think there should be limitations, if there should be limitations does it mean the person is specialising in some aspect? How do you know that this aspect is better for the person or not? If you are doing it then you have to do it fully or you want to do it such that this person is for only musculo-skeletal, no, in that situation it may not help the communities where they are working (Interview PA2 Page 10).*

He further argued that it would be difficult to implement regulations that limit the scope of practice for radiographers who have extended their roles. He added that implementation of such a regulation would be difficult in the Ghanaian setting where implementation of rules is always a problem due to organisational culture and

bureaucracy. Consequently, there would not be a need to limit the scope of practice if the regulations cannot be enforced. This participant happens to be the only radiologist participant who does not support a limited scope for practitioners who extend their roles:

*If it is supposed to be done, there should be regulations but in our environment it is difficult to regulate and limit scope of practice (Interview PA2 Page 9).*

He also contends that the clients might not be able to determine what a radiographer is allowed to do or not to do and it is likely that some of the radiographers will not practise within their scope. Such people could be a danger to the patient. He therefore argued that it would be better to offer them the requisite education in order to cover all areas of radiology, no matter how long the education takes. This view is not supported by the majority of participants:

*The person bringing the X-ray from somewhere, how will he know that you are certified to do only this or that? Some of the people might not say they are not allowed to do some the things beyond their scope (Interview PA2 page 10).*

#### 7.4.1.2.6 Standards of practice

The standards of practice need to be maintained regardless of which healthcare professional provides the service. Radiographers who extend their roles will thus be expected to maintain the same standard of practice as that provided by the radiologists (or better). One radiographer argued that it was important to ensure that the

radiographers extending their roles had the required competencies to be able to offer the service:

*It should be known that this group of people have this competence and so can offer this service (Interview PA4 Page 5).*

One radiographer contends that a dedicated training centre is needed where practitioners could go periodically to undertake refresher courses. This would update their skills so that they could keep up with current practice and maintain standards.

*There should be a centre where we can go and have two week or even a week's training to refresh our knowledge. (Interview PW1 Page 13)*

Additionally, to ensure that a high standard of practice is maintained at all times, some participants have argued that it might be useful to have a centre where reports which are written by these practitioners could be sent for review by experts before the reports are given to the patients. They argued that this would help to reduce or eliminate possible errors from practitioners before the patients receive the results. One radiographer suggested that:

*Radiological reference centres like we have the various reference laboratories, where reports that they will generate will be referenced and a team of radiologists and radiographers who will come on board and critique whatever report that comes out so us to ensure that the best reports are the ones that come out. (Interview PA5 Page 10)*

Similarly, it was argued that supervision and continuous monitoring and evaluation of the quality of services provided by the practitioners would help to ensure that standards are

maintained. It was suggested that when practitioners realised that an independent person would be evaluating their output, their performance would improve. One radiographer argued:

*Monitoring and evaluation of services rendered, if people are being monitored and supervised on a regular basis, they turn to work better than when they are left on their own. (Interview PA5 Page 9)*

#### **7.4.1.3 Why should role extension be regulated?**

Participants have given various reasons for the need to regulate role extension. Most of the reasons have been raised as various aspects of the required policy formulation. Some further reasons proposed by study participants are presented here.

A representative of the AHPC argued that because allied health professions have been unregulated for a long period of time, many unqualified personnel are practising in the various allied health professions. He added that even though there is an Act of Parliament (Act 857 2013) that makes it illegal to practise without a license from the AHPC; the AHPC is challenged because there is a general lack of compliance. There is therefore a need to start regulating extended practice right from the start so that the current situation the AHPC finds itself in concerning enforcing the law, after many years of non-enforcement, will not be repeated:

*You see unlike other health professionals in the country, allied health professionals were left unregulated for several decades, so emmm the challenges now is because the professions were left unregulated for several years, now that the regulative framework is in place the*

*awareness level is low and compliance is also low so what we are doing now is to try and create awareness and also enforce some of the provisions of the Act. In addition to that, like I like because the professions were left unregulated for several years, there are quacks in the system we so are also finding a way to deal with the quacks (Interview PA9 Page 9).*

One radiographer opined that if extended practice is not backed by regulation and does not have a legal backing it is likely to face challenges from the radiologists. He argued that they will feel their territory is being taken over by another professional group, hence the need to have a legal backing of the whole programme from training through to practice. Regulating extended practice though will not completely eliminate the possibility of resistance from radiologists, it will to a great extent reduce the levels of resistance, especially if the regulation is backed by government policy. Thus, extended practice has to be sanctioned and regulated to reduce or eliminate possible turf war between radiographers and radiologists:

*As I said earlier for us to overcome this barrier of trying to protect my territory then we should fight for a legal backing which will give us the mandate to do that education. Otherwise, radiologists will continue to protect their territory (Interview PT4 Page 8).*

Some participants argued that there would need to be a proper structure in place to support the introduction of extended roles. This structure should come with regulations that ensure the laid down structure is strictly adhered to:



*I think that there should be proper structures in place for role extension*

*(Interview PA4 Page 6)*

## 7.5 Conclusion

The chapter explored the process of policy planning, the ingredients that make up a good policy and its implementation. Three broad areas were explored: why is a policy needed to guide the introduction and practice of role extension in diagnostic radiography; what processes should policy formulation cover to ensure that the chances of success are high and possible opposition minimal; what are the constituent ingredients of a good policy.

Most participants argued in favour of a fundamental need to have a policy that will guide the introduction and practice of role extension in radiography. They also argued that government should spearhead the policy, because it is not only the largest employer of healthcare workers but it also formulates policies that guide the practice of healthcare in the country. Participants further argued that a policy from government could possibly reduce anticipated opposition from radiologists because, in Ghana, the government is very powerful and as such will lead to a smooth implementation.

Most participants argued for the need to have a broad consultation on policy development that involves all stakeholders in the healthcare sector, so that no particular group would feel excluded from the process and outcomes. They further argued that any stakeholder concerns could be raised at this stage, enabling those concerns to be taken into consideration when formulating the policy. This should allay the fears and concerns of all involved and contribute to a universally acceptable policy.

Participants discussed what they considered were the ingredients of a good policy. Most participants agreed that the policy should include regulation. However, there were diverse responses on who the regulator should be and what should be regulated. Most radiographer participants argued that the AHPC should regulate the practice of role extension, whilst most medical officers and radiologists argued that the MDC should regulate practice since the roles are originally within the scope of radiologists who are regulated by the MDC. A few participants shared the view that the Society of Radiographers should set up a College of Radiographers to regulate extended practice.

The participants' enumerated details of the areas that they felt should be regulated. These included the type and duration of education one should undergo in order to extend their role and the conditions of service that should be attached to the position of those who have done so. Practitioners of role extension should be certified and given unique identification such that by picking up a report you can clearly see who produced it. The question of where practitioners should be posted to practise once they have qualified was also explored. This was mainly to ensure that practitioners were stationed at locations where their services were most needed, not at stations that already have sufficient radiologists. The scope of practice and the standards of practice were also explored. Most participants argued that there should be a limited scope within which practitioners, who have extended their roles, could practice. They argued that this would bring about specialisation and better quality of service. It was also argued that it would be important to maintain standards of practice and to have standard operating procedures, rules, regulations, and sanctions which could be applied to anyone that fails to adhere to the rules and regulations.

The chapter concluded with participants arguing that the lessons learnt from the long period of unregulated practice of allied health professionals should guide policy makers, hence the need to regulate practice. The next chapter discusses the study findings in the context of relevant literature and considers implications for policy, education and practice of radiography in Ghana.

## Chapter Eight

### Discussion

#### 8.1 Introduction

This chapter will explain and discuss the research findings in order to answer the research questions. The chapter will also compare the findings with existing literature so that the findings are set in context.

The research set out to determine whether there are role extension opportunities in diagnostic radiography in Ghana and, if there are such opportunities, to examine how role extension can be harnessed to improve patient care.

Following the literature review the research objectives were developed.

The discussion centres on the study objectives and how each research question was answered. The research objectives were:

1. Review the current evidence of a radiologist shortage in Ghana;
2. Evaluate options for addressing shortages of radiologists in Ghana;
3. Identify opportunities for role extension in radiography in Ghana;
4. Determine how role extension might be implemented in Ghana successfully;
5. Identify factors that might facilitate or inhibit its implementation.

This chapter restates the findings of the study, compares these to existing literature and seeks to interpret whether and how the findings of the study provide a better understanding of the role extension situation in Ghana and its potential impact on patient care.

The implications of the findings for clinical practice, education, policy planning and future research and strengths and limitations of the study are also drawn out. The chapter concludes with a summary of the discussion in the form of a conclusion.

## 8.2 Review of the current evidence of the shortage of radiologists in Ghana

The study established through interviews with medical officers, radiographers and radiologists that in some instances (where there are no radiologists) radiographs were not reported on at all, and in other instances (where there are radiologists) the majority of radiographs were not reported on at all due to the volume of work and the low number of radiologists available. That there is a significant shortage of radiologists which in Ghana is further compounded by a severely skewed distribution. The net effect of gaps and inequalities in service provision results in unreported radiographs and overburdened doctors, some with inadequate training to interpret films. Accurate figures are not currently available, but anecdotal evidence suggests that over 80% of all radiographs taken in Ghana are unreported, with the highest rates being in regions with the lowest doctor-to-patient ratios. It is therefore of prime importance for policymakers to develop alternative ways to the traditional methods being used, in order to ensure that service users receive optimum quality radiography services. Unreported or misread radiographs can result in possible misinterpretation of radiograph findings by doctors who do not have the requisite education to interpret radiographs. This consequently affects the quality of services that patients receive and could possibly lead to patients returning to the hospital with the same condition. It could also have an impact on a patient's quality of health.

Globally, there is a shortage of radiologists which is mainly the consequence of advancements in technology and a huge increase in demand for imaging and intervention

procedures and various imaging guided treatments (RCR 2019, SCoR 2016, Kelly et al., 2008). As a result, many radiographs remain unreported and, even when they are reported, this is not within the international guidelines of acceptable reporting times (du Plessis and Pitcher, 2015; Kawooya, 2012). The standard practice in Ghana is that radiographs are not reported on if the requesting physician has not specifically requested a radiologist's report. This is due to the severe shortage of radiologists and the skewed distribution. The situation in Ghana is, therefore, even more dire given that most places without radiologists also suffer from a shortage of medical officers.

Internationally, one way of tackling the issue of unreported radiographs, resulting from a radiologist shortage, has been to introduce radiographer role extension into image reporting (Venter and Han-Baloyi, 2019; Bwanga et al., 2019; Paterson et al., 2004; Woznitza, 2014). There is a growing body of evidence that radiographer role extension in image interpretation reduces patient waiting times, improves patient management and reduces cost (Hardy and McIntosh, 2017; Thom, 2018; Whang et al., 2013 and Donald and Barnard, 2012). Studies have also shown that radiographers with the requisite education are able to interpret radiographs with comparable accuracy to radiologists and more accurately than other healthcare professionals (Culpan et al., 2019; Coleman and Piper, 2009). Education has been shown to improve the accuracy, specificity and sensitivity of pathology detection (Culpan et al., 2019; Ofori-Manteaw and Dzidzornu 2019; Venter and Ham-Baloyi, 2019; Piper et al., 2018; Coleman and Piper, 2009; Ahrberg et al., 2014; Harrison et al., 2015).

The current study also established that the opinions of radiographers are already being sought by medical officers on various images, however, this opinion is voluntary in that

they can choose not to give an opinion and when they do so it is often given verbally. Responses from radiographers, and some radiologist participants, also indicated that the undergraduate education for radiographers in Ghana already makes some provision for imaging pathology and pattern recognition. This course is taught by radiologists. Participants in this study, both radiologists and radiographers, argued that post registration this enables the radiographers to identify most common pathologies and also to identify a normal radiograph, but that it is not adequate for them to produce written reports. This is the only type of formalised education and training available to radiographers with regard to image interpretation in Ghana. Ghana, therefore, presents fertile ground for the introduction of role extension in diagnostic radiography.

The study also established, through the review of official documents, that the law regulating the practice of radiographers in Ghana, Act 857, does not currently permit radiographers to interpret radiographs. However, a draft legislative instrument being sponsored by the AHPC and the MoH seeks to allow radiographers to do so after undertaking appropriate postgraduate education in image interpretation in an institution that is accredited by the AHPC and the proposed College of Radiographers. This is a positive sign for the practice of radiography in Ghana and should be supported by the GSR to ensure that the legislative instrument is approved by parliament and passed into law. It is of paramount importance that the GSR engages in advocacy to build support for this legal process all the way through, until it is eventually passed into law.

Interviews in this study established that the shortage of radiologists in Ghana has been caused by limited opportunities for residency in radiology. There was just one residency programme that catered for the whole of the West African Region; this is made up of

sixteen countries. The number of slots available to each country was, therefore, very limited. However, Ghana, as a country, has started its own residency programme under the Ghana College of Physicians and Surgeons which has greatly increased the number of radiologists that are able to enrol each year. However, although the introduction of the Ghana College has increased the intake, it is still inadequate to keep up with the rate of increased workload. The shortage thus persists even with the increase in numbers of slots available.

Additionally, the study found that even with a shortage in radiologist numbers, some radiologists have taken up multiple roles that are not directly linked to their clinical duties. These additional roles therefore take them away from the clinical area, thus worsening an already difficult situation. Some of the tasks undertaken by radiologists are administrative and could be performed by others, such as diagnostic radiographers. The study also found that some of the radiologists were using official clinical time for private business (system fraud), which further compounds the delays in radiograph reports being produced. Unfortunately, the witness protection scheme in place in Ghana is not robust and as such whistle blowers are scared that their identities might be revealed with the risk of victimisation. Consequently, most people are afraid to report such offences.

Skewed distribution of the few radiologists in Ghana was one of the key findings of this study, this was revealed through the face to face interviews. The study established that the skewed distribution was mainly due to economic and professional factors. The economic reasons were mainly the result of insufficient opportunities for the radiologists to earn additional income in rural areas that are currently without radiologists. Radiologists in cities have many opportunities of earning additional income by taking up



multiple jobs. The fees charged by radiologists in the cities are also much higher than in rural areas, this is because people in rural areas are generally poorer and cannot afford the high fees charged in cities. It is important to note that salaries paid to radiologists are the same regardless of which part of the country they work in, there are however additional incentives for those who work in the rural areas in the form of free accommodation. This has, however, never been sufficient motivation to encourage radiologists to accept work in these areas. It is curious that additional sources of income, setting aside the wages and salaries, are a determinant of where healthcare professionals choose to practise. Healthcare professionals seem to be more motivated by the additional money they can earn than by serving in places where their services are needed most. Radiologists, for instance, have argued that staying in the two big cities of the country comes with opportunities of making additional income from taking up second and third jobs to earn more money. Similar opportunities do not exist in the rural areas, as such there is no motivation to move there regardless of the fact that their services are needed more. The most important consideration in choosing where to practice is where they can earn the most money.

One additional professional reason that this study found for the skewed distribution of radiologists, was the uneven distribution of equipment in the country. The study established that most areas without radiologists had just two modalities at most; a general purpose X-ray machine and an ultrasound unit. This was found to serve as a disincentive in getting either radiographers or radiologists to agree to work in these areas. It is important that the government now takes steps to ensure that all parts of the country are provided with the necessary equipment that will attract personnel to these areas.

It has, therefore, become imperative for policy makers to look at alternative ways of catering for the shortage of radiologists in Ghana. Whilst it is important to improve the distribution of various modalities of equipment across the country, and also to introduce attractive packages that will attract healthcare professionals to these rural areas, this will only solve the problem of skewed distribution. The shortages of personnel will still persist, and Ghana will not be making the best use of the skill set of our professionals in healthcare. It is important that policymakers begin to look at healthcare as teamwork and to use the skill set of all professionals in the best possible way so as to improve the quality of healthcare. This can best be achieved by critically examining the skill set of various health professionals, establishing areas where they can best contribute and then harnessing their skills in such areas in an organised and formalised manner. Professionals should perform tasks based on their skill set and not on professional boundaries. This will ensure that the skill set of the various professionals is fully utilised. In Ghana, the AHPC could start by amending the law limiting the scope of practice of radiographers. This will make it possible for the skill set of radiographers to be utilised beyond professional boundaries. Role extension in radiography could help ensure that the skill set of the radiographer is fully utilised to the benefit of clients.

### **8.3 Evaluating role extension in diagnostic radiographic as a viable solution to address radiologist shortage in Ghana**

The study findings in this section address objectives two and three. The study gave clarity to the extent of the shortage of radiologists in Ghana, a situation that is further compounded by skewed distribution as discussed above. It also showed evidence of current informal role extension activities within diagnostic radiography in all sites within the study. The findings also showed that there was support from other healthcare

personnel for the introduction of role extension in diagnostic radiography, which was not previously known, as well as the professional ambition of radiographers for the introduction of role extension in Ghana. This section will now discuss the findings.

### 8.3.1 Current evidence of role extension within radiography in Ghana

Currently there is no literature on the areas where Ghanaian radiographers have informally extended their roles. The discussion in this section is, therefore, heavily reliant on the findings of this study and anecdotal or experiential evidence.

The study findings showed that radiographers at some sites had extended their roles, even though this was not officially sanctioned and had no legal backing. All the medical officers in the study indicated that they had worked with radiographers who had extended their roles unofficially, and that this had occurred in areas such as verbal image interpretation, performing specialised examinations such as intravenous urography and hysterosalpingography without a radiologist being present, and fluoroscopic examinations, cannulation and injection of contrast medium. A medical officer in one rural hospital argued that before they had a radiologist in their facility, the radiographers were already helping with image interpretation. Other medical officers indicated that, at the time of the study, the radiographers in their facilities were practising in roles not traditionally within their scope of practice. Radiographer participants also indicated that they had already extended their roles. The roles taken up were mostly in injection of contrast medium, cannulation, as well as performing some specialised examinations such as hysterosalpingograms and image interpretation. These roles were taken up in an informal manner and were not supported by law or any official policy directive. Radiologists also indicated that radiographers had extended their roles mainly in injection

of contrast medium. This finding was previously only known through anecdotal evidence. The implication of this finding is that if those radiographers who have informally extended their roles had not done so, the services they provide would not be available to the services users at all. This would result in sections of the public being denied access to critical healthcare services.

Smith et al (2007) argue that radiographers in Australia perform various extended clinical roles, most of which are informal and have developed over time. These have become part of the roles of senior radiographers. This is similar to what pertains in Ghana from the findings of this study. It is important to note that these roles have evolved over time according to local need; however, the radiographers that are performing such tasks are exposing themselves to risk because their activities are not backed up by law or policy. The training for these roles is often done on the job so is not organised in any formal manner and as such might not be standardised, correct or safe.

It is important that formal role extension is introduced so that radiographers performing these tasks can be guided by policy and are fully regulated. Role extension will thus become formalised and radiographers will be practising within their professional scope of practice. Whilst those radiographers who have extended their roles informally may be helping to improve imaging services and, by extension, improving the patient experience in the hospital, the extended roles they have taken on are not supported by law and they could be held liable if something were to go wrong. It is also worth noting that being asked to offer an opinion on image interpretation is not the same as producing written reports. However, if the opinion of radiographers is constantly being sought on image interpretation, it means they are a valuable resource that could be harnessed. There is

clearly a need for a service that the radiographers are currently providing, even though the law governing their practice does not allow them, legally, to provide these services. It is therefore important that role extension is introduced to guide the way in which this valuable resource can be harnessed to the benefit of the patients and that this is done in a legal, organised and standardised manner. With a growing middle class and increased access to legal services in Ghana, there could soon be a rise in medical negligence legal cases. In this context, it is important that steps are taken by the MoH and GHS to formalise role extension so that the radiographers taking up these extended roles will be protected by the law.

A study by Ofori-Manteaw and Dzidzornu (2019) compared the accuracy of image interpretation between junior doctors and radiographers in Ghana. The study determined that there was no statistically significant difference in the accuracy of junior doctors and radiographers in that hospital and also that training improved their accuracy. This finding supports the wider inference from this study, that radiographers are a clinically reliable source of image interpretation that could be drawn upon to address the radiologist shortage in Ghana.

### 8.3.2 Support from other healthcare personnel.

The study found that most radiologist participants were in support of the introduction of role extension in diagnostic radiography in Ghana; with some provisos. One radiologist at a rural hospital, where he worked alone, was of the opinion that role extension is an important development, and that it would improve the quality of radiology services to service users. A view that was supported by another radiologist participant who is involved in the education of radiographers. They, however, were quick to add that

radiographers would require further education and that role extension should be formalised and guided by a policy from government. This finding, that some radiologists were in support of radiographer role extension, aligns with William (2009) who found that most South African radiologists were in support of radiographer role extension and were willing to play various roles including, crucially, as mentors and lecturers. This is particularly significant as South Africa is a developing country like Ghana and both countries are part of Africa with similar cultural and economic systems.

However, one radiologist in an urban hospital was not in support of radiographer role extension. He argued that radiographers do not have a medical background and as such would not be able to interpret images accurately since some of the images have 'clinical implications' and the radiographers will not be in a position to understand those images. Interestingly, the two radiologists who were in support of role extension in diagnostic radiography, were both involved in clinical practice and higher education. One was involved with the education of radiographers and the other involved in the education of medical students. The radiologist who did not support role extension was involved only in clinical practice and worked in Accra, a city with the highest concentration of radiologists. His views might have been influenced by the fact that he practises in Accra, and as such he might not be exposed to how dire the situation of unreported radiographs is outside the capital. However, one of the radiologists who supported role extension, was also based in Accra. This may have been because he is involved in the education of radiographers, is better informed about the quality of education they receive at the undergraduate level and feels that this adequately prepares them for postgraduate studies in role extension. The radiologist who did not support role extension referred to

the radiographer at the same facility as himself as 'his radiographer' creating an impression that he owns this radiographer. He does not seem to recognise the radiographer as an independent professional colleague, but worryingly as 'his radiographer'. Significantly, the two radiologists who were in support of role extension were both involved in the education of radiographers and medical students and so did have a perspective on which of the two professions was best placed to interpret radiographs in the absence of the radiologist. Hence their support for radiographer role extension in reporting. The radiologist who was against role extension for radiographers, aside from being in Accra, also did not have the benefit of being involved in the education of radiographers. As such he may not have been in the best position to determine whether radiographers have the requisite background to receive further education so that they can extend their roles. It therefore appears that his views on the level of education of radiographers were possibly based mainly on assumptions.

Of critical importance is the argument by the proponents of role extension, they feel that radiographers are best positioned for image interpretation, in the absence of radiologists, because they produce the radiographs and their education gives them the requisite basic knowledge needed for accurate image interpretation. It is further argued that undergraduate radiographers are offered modules in basic pattern recognition and image interpretation, this is not offered to medical officers who usually do the interpretation in the absence of the radiologists. This finding aligns with literature which contends that some consultants within radiology do support role extension (Cameron and Materson, 2000; Marsden et al., 2003). Others, however, also argue that supporting role extension is tantamount to 'professional suicide' (Torreggiani and Hamilton, 2003). It appears that

in Ghana, radiologists in rural areas and radiologists involved in the training of other radiologists do support role extension for radiographers. Whereas those radiologists in the capital city and not involved in the education of radiographers do not support role extension. It could be that the radiologists in the rural area are faced with difficult situations on a daily basis and therefore open to the idea of role extension knowing the capability of radiography services. The radiologists involved with education of radiographers could also be keener, they know what the curriculum entails and are confident in the students' abilities and are supportive of them.

All the medical officers who participated in the study supported the introduction of role extension in diagnostic radiography. They argued that they already relied on the professional opinion of radiographers in interpreting radiographs. They were of the opinion that if role extension is formalised, and radiographers are given the requisite education, it will make their work easier and help improve the quality of radiology services in particular, and healthcare services generally. It is worthy of note that even the medical officer stationed in Accra, with the highest number of radiologists, had to deal with unreported radiographs and delays in the reporting of radiographs. Both situations have often led to seeking the opinion of radiographers, who are mostly readily available within the work environment. This finding is supported by McSherry (2004) and Gerrish and Ferguson (2000) who argue that many medical officers and their colleagues have openly embraced these changes.

Healthcare requires teamwork. As such it is important to get the support of other healthcare personnel in order for role extension to succeed, especially given the interlinked nature of the working relationships of the various professionals involved in



medical imaging. Support from healthcare workers is important because, as this study proposed, role extension should be introduced in rural areas where there are currently no radiologists. In these areas radiographs are interpreted by medical officers and physician assistants. It is therefore very important to get their support in the introduction of role extension as they are in the frontline of healthcare delivery in rural areas and can present a more accurate picture of the current situation. They are also in a good position to explain the possible benefits of its introduction and as such could serve as advocates for it. The support of radiologists is also critical because the roles taken up by radiographers are originally within their scope, getting them to offer support might be a huge boost. They will also be needed to play various roles in the education and in the day to day implementation of role extension. It is therefore encouraging to find that a large majority of the participants in the study, across all the professions, offered support for the introduction of role extension in diagnostic imaging in Ghana. This support from various healthcare professionals, especially those in the rural areas, is very important as this study proposes that role extension should be standard in rural areas, in particular those areas with no radiologists. This finding aligns with William (2006) who reiterates the importance of collaboration between radiologists and radiographers if role extension is to be successful.

### 8.3.3 Radiographers' professional ambition

The study findings suggest that radiographers are keen for role extension in diagnostic radiography because they believe it could result in professional autonomy and recognition. Radiographers argued that if role extension were introduced in Ghana, it would afford them the opportunity to play a significant role in decision making on the

patient pathway. This, they argued, would then lead to recognition of the radiographer's role in the pathway of service users. They further argued that role extension would help improve the professional profile of radiographers, especially as they may currently be viewed as 'photographers' by other healthcare personnel and the general public. This finding is supported by Lancaster and Hardy (2012) who concluded that radiographers in the UK have a positive attitude towards role extension and that radiographers also contend that role extension improves their professional profile and enhances their role in decision making on the patient pathway. Even though this was a UK study and there are social and cultural differences between Ghana and the UK, the study results suggest that radiographers in Ghana are convinced that the introduction of role extension will improve their professional profile. This will also lead to recognition and appreciation of the role of the radiographer amongst colleague healthcare workers and the general public.

Furthermore, it was established in the present study that another reason for radiographer support for role extension was premised on the fact that its introduction would lead to significant improvement in the quality of care that service users will receive. They argued that role extension would reduce patient waiting times, reduce possible misdiagnosis resulting from misinterpretation of radiographs and also reduce cost. The resultant effect of this should be improved quality of healthcare to the service user. This position is supported by existing literature (Hardy and Culpan 2007; Henderson et al., 2013; and Torres-Mejia et al., 2015) which contends that role extension affects patient management positively by reducing waiting times and cost and improving patient safety. It must, however, also be noted that the notion that role extension automatically improves quality of service and reduces patient waiting times might be too simplistic. Obviously, the

imperative will be to seek gains made in that respect, but caution has to be exercised with regard to the anticipated improvements. For the local Ghanaian situation any level of improvement of patient care would be extremely helpful given the current situation of delayed reports and unreported radiographs.

Additionally, the findings from this study indicated that the introduction of role extension is likely to enhance job satisfaction. Some participants, mainly radiographers, argued that the introduction of role extension would be likely to improve job satisfaction because it will bring about professional autonomy and radiographers will be more directly involved in the patient pathway. Radiographer participants advocated for a national career structure to be introduced as part of role extension. The findings also suggested that if the introduction of role extension does not include the development of a national career structure that takes into account the academic qualification, duties and responsibilities of radiographers, then the policy would be likely to fail. It is critical to note that currently in Ghana any additional qualification, beyond the entry level bachelor's degree, does not affect the earnings and roles of the radiographer and this acts as a disincentive for further education. In the UK the introduction of a national career structure, the four-tier system, served as the basis for the new roles and helped outline a pathway of progression from practitioner to advanced and consultant practitioners (Kelly et al., 2008). A similar national career structure, which takes into account academic qualifications and experience, will be recommended for the introduction of role extension in Ghana. Importantly, the report on a national pilot on the implementation of the four-tier system in the UK established, amongst other things, that there was a need to widen the routes for accessing clinical careers as a means of improving radiography recruitment and retention. The report

reiterated the point that the structure was important because it involved the professional ambitions of those involved (DoH, 2003). Given that the number of universities in Ghana offering radiography education at the undergraduate level has increased from one to four, this means the numbers of radiographers qualifying at each will increase significantly. Thus, role extension might bring about the needed motivation for the retention of radiographers graduating from those universities. The increased numbers will also ensure that there is no shortage of qualifying-level radiographers resulting from role extension in Ghana.

#### 8.4 How can role extension be implemented in Ghana successfully

##### 8.4.1 Why do we need a policy for role extension?

Most participants of the study argued that there was a need for appropriate health policy to guide the introduction of role extension, particularly as it would involve blurring of professional boundaries. They argued that a well laid out policy would help to guide the whole process. Even though there was agreement across all the professional groups on the need for a policy to guide the introduction of role extension, the reasons assigned differed between professional groups. The radiographer participants mainly advocated for a policy because they felt that was likely to reduce or eliminate anticipated resistance from radiologists. The radiologists and medical officers on the other hand, argued that a policy was needed to guide extended roles and to ensure that only qualified persons were allowed to extend their roles and also to ensure that standards were maintained.

In the UK the introduction of the National Health Service (NHS) and Community Care Act (1990) challenged some of the ways that care was provided and resulted in the blurring

of professional boundaries. This eventually led to the creation of new roles to meet the ever-increasing demands of healthcare (NHS, 1990).

Additionally, in Ghana the formulation of healthcare policy which guides practice is undertaken by the government, through the Ministry of Health (MOH). This study found, through review of official documents, that the MoH formulates policies and that those policies are implemented by the GHS. The role of the MoH in formulating a policy to guide the introduction of role extension in Ghana, is very critical. It is important that the MoH is provided with compelling evidence on the benefits that are likely to accrue to patients, radiographers, radiologists and the general public with the introduction of role extension. The MoH can then begin the process of consultation with stakeholders in order to create a policy which will guide the introduction of role extension. The consultative process, and the input of stakeholders will, to a large extent, help inform policy. It is important that the GSR presents a united front with a common goal during the consultative process in order to prevent any other professional group from hijacking the process. It is critical that their input is made forcefully at this early stage.

In the UK the Department of Health (DoH) expanded on the four-tier system in a report entitled 'Radiography Skill Mix' to cover diagnostic and therapeutic radiography, effectively heralding the introduction of role extension (Price and Edwards, 2008). A similar model could be developed to suit the Ghanaian context using a panel of experts put together by the MoH.

#### 8.4.2 The process of policy planning and implementation.

There is a popular aphorism in Ghana that 'if you fail to plan, then you have planned to fail'. It is therefore important that planning is key in the process of policy formulation and implementation.

The study found that the process of policy planning and implementation involves various stages, all of which are important. These stages include consultation with the key stakeholders in healthcare on role extension, sensitisation of healthcare personnel and the general public and finally the implementation of the agreed policy.

The findings, as echoed by most participants, placed emphasis on the need to have a broad consultative process that involves all the key stakeholders in the sector. The results indicated that it was critical to collate the views and concerns of all stakeholders including service users, healthcare personnel and the various interest groups. The views from this consultative process should inform the direction of the policy going forward. Radiographers expressed concern about the likelihood of radiologists objecting to the introduction of role extension in Ghana, due to the fact that they might feel their professional territory is being violated. However, radiographers suggested that with broad consultation and sensitisation it was possible that all their concerns could be factored into the policy. For example, a panel of experts and relevant stakeholders could be invited to a workshop or meeting, the relevant questions could then be discussed so that they could arrive at a consensus on a policy to guide the introduction and practice of role extension in diagnostic radiography. This could be based on the St. Gallen expert breast cancer treatment consensus meeting model (Senn, 2013). Sensitisation should involve explaining the potential benefits of role extension to healthcare and critically important, that role extension is seen as complementary to the work of radiologists and not competition. It is

highly possible that at the end of the consultation process they might not have objections to the introduction of role extension, their fears may have been addressed and they would have developed a sense of ownership of the policy because they have been involved in the process.

Furthermore, the study established that following stakeholder consultation there is a need for public advocacy and sensitisation of the general public, including members of the stakeholder groups that were represented in the consultative process. It is important that the general public is sensitised before implementation of the policy commences. It is also critical that leadership of the various stakeholder groups accept and formally recognise role extension as being within the scope of practice of appropriately trained radiographers and that the AHPC take steps to include it within the scope of practice of appropriately qualified radiographers as was done in the case of the UK (SCoR, 2013; HCPC, 2013; RCR, 2018).

The next logical step after the sensitisation would be to implement the adopted policy. The policy, as implemented, would be subject to periodic review in order to ensure that it remains relevant and fit for purpose.

#### 8.4.3 Ingredients of a good policy on role extension

This study established that the ingredients of a good policy on role extension in Ghana might be significantly different from those of the developed countries due to the specific situation of the country. These ingredients will better serve the local situation. The ingredients identified as being vital to a good policy on role extension in Ghana included **regulation of role extension, what exactly should be regulated and who should be the**

**regulator.** There is a need for role extension to be regulated so that there is a set of criteria that must be met in order to practice in an extended role.

Radiographer participant responses showed that the regulation should set out clearly the approved education required for one to take part in role extension. These regulations should include programmes being vetted and institutions accredited by an approved body. This it is believed will curtail the proliferation of unregulated programmes purporting to offer education for role extension. This finding is supported by literature in the UK where programmes and institutions are vetted by the Society and College of Radiographers (SCoR) before being given approval to run (SCoR, 2013).

The findings also indicate that it is important that the conditions of service and rewards for extended role practitioners form part of the regulations; this would serve as an incentive and would motivate radiographers to take part in extended roles. If there are no rewards for pursuing further education and assuming additional responsibilities, there is likely to be apathy from radiographers. This finding aligns with Paterson et al (2004) who argue that until such a time that role extension becomes part of the routine practice of radiographers, it is important that radiographers who extend their roles are rewarded for the additional roles they have taken on.

Additionally, the findings of the study suggest that due to the local situation in Ghana, it is of prime importance that the geographic areas in which radiographers can practice after successful completion of role extension education is also regulated by policy. This will ensure that qualified radiographers can practice in areas where their services are most needed. It is important that before radiographers can enrol on an education programme for role extension, they have been nominated by a hospital that requires their services.



They should be required to sign a contract with that hospital to practice there for a fixed period after successful completion of the programme. The policy should also outline the scope of practice of radiographers following successful completion of the education. This will ensure that radiographers, after successful completion, will know their limits and as such are unlikely to attempt to practice beyond the scope of their education.

This study also established that the regulation should clearly outline standards of practice and conduct for radiographers taking part in role extension. Radiographers should be made accountable for their action and inaction and would have to adhere to the established standards of practice and conduct set out in the policy (CoR, 2002 and HPC, 2003). Failure to adhere to these standards should be penalised and the severity of the punishments would be determined by the nature of the offence.

The findings also show that the regulator of the practice of role extension should be clearly indicated in the regulation. This will prevent possible confusion about who should actually be the regulator. There is potential for both the MDC and AHPC to assume that they should be the regulator. Given that the clinical roles being adopted are traditionally within the scope of radiologists, who are regulated in Ghana by the MDC, it is likely the MDC would want to take up the regulation of this practice. The roles are being taken up by radiographers who are regulated by the AHPC in Ghana. The AHPC could also justifiably seek to regulate role extension since the practitioners do not become radiologists after taking up their roles. Interestingly, in the UK advanced practice in radiography does not have separate regulators from the HCPC and practitioners are required to practice within the standards of practice and ethics of the HCPC and CoR (CoR, 2002 and HPC, 2003). It has been argued that regulating role extension nationally could stifle the development of

extended roles according to local needs. However, in the Ghanaian context there is a need for role extension to be regulated such that roles will only be extended in areas of greatest need.

#### 8.4.4 Radiography education in Ghana and the need for curriculum review.

The data from the interviews of radiographers in higher education and the review of official documents revealed that radiography education in Ghana has been through several phases. These include the period when nurses were given a few days of training and allowed to operate radiographic equipment, to the current system where the basic radiography education is a bachelor's degree. There are also postgraduate programmes in various aspects of radiography currently run in Ghana.

The study also established that the current curriculum in use at the undergraduate level was not designed with role extension in mind. It has therefore been argued that it should be reviewed and that changes would need to be incorporated in light of the need for role extension and skills that might be required in the near future.

Whilst there was consensus amongst most participants regarding the need for review of the current curriculum, the reasons for this differed. One radiologist was of the view that the review is necessary because the curriculum does not provide radiographers with a strong enough background which can be built upon for role extension. Some participants, from across all professions, believed that the current curriculum was sufficiently robust to provide radiographers with a strong background that can be built upon at the postgraduate level for role extension. However the proponents of this stance contend that there is a need for undergraduate radiographers to be given further education at that

level so that they are able to provide initial comments on plain radiographs, hence the need for a review of the curriculum. Similarly, Paterson et al (2004) suggested that undergraduate level education for radiographers should include image interpretation as this is important to radiographer education. It is important that educational curricula are reviewed occasionally to meet service requirements and clinical needs (Pratt and Adams 2003) hence the need for the review. Sloane and Miller (2017) argue that radiography as a profession is in flux and as such there is a need for the curriculum to be continuously reviewed to meet the changing demands of the profession.

#### *8.4.4.1 What level of education and training is needed for role extension?*

The general consensus amongst participants was that education and training should be at the postgraduate level. However, there was not unanimity on whether the education should be a master's programme or a 'professional degree'. Interestingly, the proponents of the 'professional degree' argued that they would prefer it because a master's degree seeks to have a focus and that is not desirable. However, the proponents of the master's degree are advocating it because it seeks to have a focus which they contend is exactly what is needed for role extension. The proponents of the 'professional degree' explained that it is a postgraduate programme just like a traditional masters but with more emphasis on clinical hands on practice than theory. In the UK in order to extend one's role, the radiographer must complete a postgraduate level education that has been approved by the Society and College of Radiographers (SCoR) and meet all the associated requirements (SCoR 2013).

Furthermore, findings of the study also indicated that education for role extension should be a combination of theory and clinical 'hands on' practice. It was argued that a

combination of theory and clinical hands on practice would expose the practitioners to the real situation in practice, rather than just what is in textbooks. This finding is similar to what pertains in the UK, where education for extended roles in image interpretation involves both theory and clinical hands on experience. The majority of the current education for radiographer reporting is at the postgraduate level and is provided by institutions of higher education, it involves both classroom components and clinical components (Culpan et al., 2019). An Inter-Professional Advisory Team (IPAT) set up by the Australian Institute of Radiography (AIR) in 2012, to amongst other things develop an implementation model for advanced roles in radiography, recommended that postgraduate qualification towards extended practice should include academic, clinical and a substantial piece of research. It is argued that a balance of academic and clinical components of education will afford the participants the knowledge and clinical skills needed to support their practice. The contention is that making research a part of the education for extended practice might increase the research interest of radiographers. There is the need to learn from best practice elsewhere; therefore, adopting the UK model of postgraduate education for role extension and making adaptations to meet the local needs of the country would be the best way forward.

#### *8.4.4.2 Entry requirements for role extension education*

Furthermore, one radiologist in a rural hospital argued that considering the local situation where most professionals prefer to live and work in the big cities in Ghana, there is a need for the introduction of additional entry requirements. This would ensure that all radiographers enrolling in role extension directed education are nominated by hospitals within areas that either lack radiologists or are the hardest hit by the shortage and skewed

distribution of radiologists. If this is not done, radiographers will extend their roles and stay within the big cities, as with the radiologists, and the problems will persist. It is, therefore, of critical importance that one of the entry requirements is that the radiographer should be nominated by a hospital in an area without radiologists and must sign a contract with that hospital requiring them to work in the hospital for a fixed period before they can seek appointment elsewhere. This could act as a barrier to role extension but if it is well executed, it will ensure the impact of role extension is felt where it is needed most. There is no literature underpinning this finding, but it is particularly important and novel in the case of Ghana.

At the heart of entry requirements is the need for consultation between higher education institutions, the GSR, GHS, MoH and all stakeholders, to set out the entry requirements taking into consideration the local needs of the country so that role extension is a success.

#### *8.4.4.3 Who should be involved in education for role extension?*

The findings from this study demonstrated that the task of education for role extension should involve various stakeholders within healthcare in the country. Consultations and collaborations are therefore needed between higher education institutions, professional bodies like the GSR and the Ghana Association Radiologists (GAR), the MoH, GHS and regulatory bodies such as MDC and the AHPC.

The institutions of higher education would be responsible for running education for extended roles, however professional bodies like the GSR and GAR have an interest in the way in which the education is organised and what it seeks to achieve at the end of the programme. There is therefore a need to involve both societies in the process. The roles that will be taken up by radiographers are currently within the scope of the radiologists,

it is therefore imperative that they are involved in the education process for extended roles as members of faculty, external examiners and also as clinical mentors (SCoR 2010). The GSR on the other hand will be interested in setting up a College of Radiographers that will accredit and regulate the various educational courses for extended roles. It is important that GSR as a professional body presents a united front and takes an active part in the consultation processes so that other professions do not dominate. The MDC and AHPC regulate the practice of the radiologists and radiographers respectively and would be interested in ensuring that standards of practice are maintained regardless of who is performing a task. Maintaining standards of practice to a large extent depends on the quality of education that practitioners receive; as such both regulatory bodies will be keenly interested in the way in which education is rolled out. It is also important to ensure that only radiographers who have undertaken the recognised and accredited education programme are allowed to take on extended roles (SCoR 2013, RCR 2018).

Radiographers in higher education posited that radiographers in clinical practice will be needed to assist in the process of education for extended roles by providing images that can serve as the imaging test banks for demonstration purposes and can also be used to examine practitioners who are taking part in the education. It is also very important that radiology service managers or chief radiographers across the country are involved in the education to ensure that graduates from the programme meet changing clinical needs and the potential to grow role extension gradually. It is therefore important to involve them in the consultative processes so that they can feel a sense of ownership of the programme (Sloane and Miller, 2017).

#### *8.4.4.4 How should competency be determined?*

Radiologist and radiographer participants indicated the need to agree on how competency should be determined during and at the end of education for extended roles. They argued that it was important to indicate how the competence of radiographers taking part in education for extended roles would be measured before the start of the programme. They also indicated that education for role extension should include both clinical and academic components. Consequently, it is expected that competency will be determined for both components. The determination of competency for the theoretical aspects can be done by the use of Objective Structured Examination (OSE) (Piper et al., 2014). The clinical component should include consultant radiologists or qualified reporting radiographers who administer and assess clinical examinations that involve case viewing and reporting (Culpan et al., 2019). The reason for involving consultant radiologists and qualified reporting radiographers is to ensure that the most qualified people in the area are used to determine competency. The formal examination should have a minimum mark that must be attained for one to be deemed as having passed. The IPAT set up by AIR amongst other things, recommended that proficiency should be determined by successfully completing a standardised accredited postgraduate academic programme, completing a written piece of research work which should be examined and a minimum number of supervised and evaluated hours in clinical practice.

#### **8.5 Factors that might facilitate or inhibit its implementation**

The study identified factors that could inhibit the introduction of role extension in diagnostic radiography. These factors include resistance from radiologists, shortage of

radiographers, lack of a national structure, and equipment procurement and maintenance.

#### 8.5.1 Radiologist's resistance.

Radiologist resistance has been identified as the main obstacle facing the introduction and implementation of role extension in diagnostic radiography in Ghana. This was the view of most radiographers. However, one of the radiologist participants indicated his discomfort at the prospect of role extension. Whilst he was unwilling to categorically state that he did not support role extension, he argued that radiographers will be challenged in their ability to interpret radiographs. For this participant, radiographs have clear clinical implications and because radiographers do not have a medical background, they will not appreciate the clinical implications and as such will struggle with image interpretation. He added that even if role extension were introduced, it would have to be done according to the following conditions: Practising radiographers should not be a part of role extension, he believes they do not have the right educational foundation to extend their roles. The undergraduate curriculum should be reviewed so that radiographers take courses with the medical student. These courses are anatomy, physiology and pathology. Interestingly he did not know to what depth radiographers already study these subjects, but feels it is not to the same standard as for medical students. The graduates from the revised undergraduate programme can then undertake postgraduate education to extend their roles he added. The two other radiologist participants were in support of role extension but had provisos that have been discussed earlier in this chapter. This finding is supported by literature where the RCR in Scotland argues that non-medical personnel writing of reports is not the right solution to the radiology crisis in Scotland. The RCR further



contends that employing foreign radiologists to augment the numbers in Scotland is a preferred option (RCR, 2015).

#### 8.5.2 Shortage of radiographers and discriminatory practices

The documentary review from the study found that there was a general shortage of healthcare personnel across Ghana, the situation being worst in the rural areas especially in the northern part of Ghana. The study established from the review of official documents that there were about 300 radiographers registered and practising in Ghana. This number is inadequate for a population of over 25 million. This will therefore be a challenge to the introduction of role extension in radiography, there is likely to be a shortfall of radiographers resulting from the introduction. However, the study also found, from the review of official documents, that the number of universities offering radiography at the undergraduate level has increased from one to four. This increase is enough to fill any vacancies that might arise from the introduction of role extension. The shortage of radiographers resulting from the introduction of role extension was one of the major criticisms of the introduction of role extension in the UK.

The study also established, through the review of official documents, that the MoH and GHS responded to issues concerning radiographers differently from the way in which they responded to issues concerning medical officers. Radiographers have mainly been discriminated against by the actions and inactions of the MoH and GHS. The situation has therefore led to radiographers in Ghana rejecting offers from the public sector and subsequently led to a shortfall within the public sector. The response of the MoH and GHS has been to offer 10 day training for biomedical engineers and medical physicists to fill the resulting shortfall. Even when the dangers of this intention were communicated

to the MoH and GHS, they did not withdraw their intentions. The GSR proffered some short and long-term solutions but not even these were convincing enough for there to be a change in approach. Solutions offered by the GSR included motivation for radiographers who accept work in rural areas and other financial and non-financial incentives, these were rejected by the MoH and GHS.

However, the response of the MoH and GHS to a refusal by medical officers to accept offers from the public sector to work in rural areas was to offer incentives, both financial and non-financial, as a source of motivation. The difference in approach, with a shortage of radiographers and medical officers, exposes some underlying professional tensions.

Most policy makers within the MoH and GHS are medical officers and as such will do whatever it takes to protect their profession but mostly take decisions that seek to undermine other professions. The discriminatory nature of some of these decisions may risk destroying the harmony that is needed in clinical practice as healthcare is teamwork. This practice has the tendency to increase the attrition rate of radiographers, thereby reducing the number of radiographers in practice. A shortage of radiographers as has been explained above could inhibit the introduction of role extension in radiography.

This finding is new knowledge, it illuminates the way in which the MoH and GHS discriminates against radiographers in Ghana. There was previously anecdotal evidence of this happening, but until now no research had firmly established its precise nature.

### 8.5.3 Lack of national career structure

Radiographer participants were concerned that the lack of a national career structure that takes into account educational qualification and responsibilities of radiographers, role extension is likely to fail. This is because currently educational qualifications, beyond the

basic degree level, do not contribute to placement on the salary structure and serve as a disincentive for further studies. Consequently, if the status quo remains, radiographers will not be motivated to undertake further study or take on additional responsibilities and will not be rewarded appropriately in terms of placement on the salary structure. The study also found that if role extension does not come with conditions of service reflecting the additional qualifications and responsibilities of the new roles, radiographers will not be motivated to take part.

The literature shows that within the UK the introduction of a national career structure, the four-tier system, served as the basis for the new roles and helped outline a pathway of progression from assistant practitioner, practitioner to advanced and consultant practitioners (Kelly et al., 2008). The finding indicates that Ghana will be better served if, as part of the introduction of role extension, a national career structure is developed in consultation with all the relevant stakeholders to ensure that their concerns are taken on board. The national career structure should be one that takes into account educational qualifications, responsibilities and years of practice. This will ensure that the inimical effects of the lack of national career structure on the introduction of role extension in Ghana are curtailed.

#### **8.5.4 Equipment procurement and maintenance.**

In this study equipment procurement and maintenance have been found to serve as a source of discontentment and despondency amongst radiographers. This has also been found as a possible barrier to the introduction of role extension as it cannot take place without properly functioning equipment. This is because radiographers do not have a say in decisions on the procurement of equipment and even when their opinion is sought, the

suggestions made are not utilised. This situation has often led to the procurement of equipment that is not fit for purpose. The current study findings indicate that sometimes experts make recommendations for particular types of equipment to be procured, but when the equipment is supplied it is not what the experts recommended. This could be as a result of the directive in the procurement law that places emphasis on cost rather than quality. It is more expensive in the long run to buy lower quality equipment because it is less reliable.

The findings also show that administrators have a greater input than expert technical personnel in procurement decisions, since the most important factor is cost. The study also found that due to the limited involvement/non-involvement of the technical personnel in the procurement process, these entities sometimes ended up with contracts of procurement that do not include critical components like after sales services, availability of spare parts for the equipment supplied, training of local personnel to act as first line technical support and timelines for the servicing of equipment. The absence of these important components in the procurement contracts in turn affects the delivery of clinical services. In the inevitable event of equipment breakdown, there is no contract requiring the suppliers to repair the equipment, no timeline within which the equipment should be returned to clinical use, no guarantee of local experts that can repair the equipment and no guarantee that spare parts can be found locally. This often results in prolonged downtime for equipment, for example

<https://www.graphic.com.gh/news/health/ghananews-korle-bu-mri-ct-scan-services-restored-africano-healthcare-repairs-machines.html>).

The despondency resulting from poor equipment procurement leads to frustration in having to work with equipment not fit for purpose or frequent breakdown of equipment. Role extension cannot be effectively implemented without properly functioning equipment. A despondent and frustrated workforce could be a barrier to the introduction of role extension, consequently it is important that issues causing despondency and frustration are tackled before role extension is introduced in order to ensure smooth implementation.

The study, primarily in the interviews, found that procurement and supply of equipment for radiology service facilities were centralised under the auspices of the MoH. This process therefore results in equipment purchased being 'one size fits all'. In other words, the individual needs of facilities were not taken into consideration before the equipment was purchased. The technical personnel within the facility were not consulted on their needs and the types and specifications of equipment that would best serve those specific needs.

<https://www.ghanaweb.com/GhanaHomePage/NewsArchive/Latest-MRI-facilities-for-public-hospitals-227768>)

Whilst there was no direct evidence of corruption being the motivation for centralised equipment purchase and the non-consultation of experts, or even in instances where they are consulted their input being disregarded, there was widespread suspicion of corruption. This practice has the tendency to affect the morale and working practice of radiographers. A demotivated workforce might not be interested in taking part in role extension and as such this might serve as a barrier to its introduction. It is important that

the source of demotivation is tackled to ensure that the workforce is motivated and ready to take part in role extension if its introduction is to be successful.

#### 8.5.5 Regulatory Challenges

Health professions the world over are regulated and Ghana is no exception. Radiographer participants indicated that the medical, nursing and pharmacy professions have been regulated over the years, but the allied health professions remained unregulated until 2013 when the parliament of Ghana passed Act 857. This Act created the AHPC the body that regulates all allied health professions in Ghana. The long period of unregulated practice meant that it was an 'open-for-all' situation which resulted in many untrained personnel practising in the various professions including radiography.

The study also established that the AHPC is under-funded and does not have the required human resources to carry out its regulatory activities. This situation thus affects how efficiently the AHPC is able to perform its duties. The first challenge faced by the AHPC was to register all qualified allied health personnel in the country and to then determine who is/is not allowed to practice. This process was hampered by lack of resources.

The AHPC by law is an agency of the MoH and consequently is funded by the MoH. This means that it is not completely independent of the MoH and, as such, it can be starved of resources when it is pursuing an agenda that the Minister of Health does not support. Review of official documents showed the GHS, with the support of MoH, was to offer a 10-day training for biomedical engineers to operate X-ray equipment across the country without licenses, which is against the law. The AHPC has maintained a silence on the issue which has led to suspicion. The suspicion amongst radiographer participants is that either

the AHPC has been silenced or the registrar is afraid of losing his job since he is appointed by the president. A review of official documents revealed that the registrar did not attend any meetings on this issue, even though he was invited at all times. It took the GSR to fight the policy, which has only been suspended.

The AHPC on its own has not been proactive in increasing its internally generated funds. The AHPC should be able to finance itself from the revenue generated from registration of professionals and renewing of registrations annually if it were to carry out a rigorous registration process and also a strict enforcement of the law requiring that only registered personnel are allowed to practice. The AHPC could make the whole registration process easier by ensuring that the whole process can be done online without having to visit the AHPC offices to complete the process. This it is believed will encourage more qualified personnel to register and continuously renew their licences. Again, if the AHPC divides the country into zones and sets up taskforces in the various zones of the country for law enforcement, it is likely to increase compliance and the resources available to the council to perform its legal duties.

The AHPC could liaise with HeFRA to ensure that every facility, which requires a renewal of their license or registration with HeFRA, compels its members of staff to renew their licenses in order to practice with the various professional regulatory bodies. If this became a requirement for the facility to obtain a license to operate, the management of these facilities would only be able to employ personnel who are registered to practice. This will improve compliance and also increase the revenue generated from registration and renewal. For role extension to be introduced, stakeholders will have to be convinced that the AHPC can effectively regulate it. To do so, the AHPC will have to demonstrate how

effective it has been in regulating the practice of radiography, hence the need to address the challenges faced by the regulatory authority before the introduction of role extension.

#### 8.6 Strengths and limitations of the Study

The case study approach allowed for the use of multiple sources of data, providing different perspectives which revealed a broader understanding of local and national issues. The use of semi-structured interviews, for example, gave the participants the opportunity to explore various issues which would not have been possible using a questionnaire. Data obtained from interviews were supported with documentary and observational data. Official documents were used to support data obtained from interviewing participants. For instance, government documents from the Director General of the GHS supported interview data that indicated the GHS gave medical officers preferential treatment compared with radiographers. Observations were generally carried out by 'shadowing' participants and Spradley's (1984) method of people, places and events format was used. Official documents provided the least useful source of data, the only source of data that specifically mentioned role extension was the draft legislative instrument for Act 857 (2013).

Focus groups could have been used as part of the study to explore how the various professions make a case for their position, however I decided it was unlikely to generate the type of interaction that was needed. This is because culturally in Ghana it is unlikely that subordinates would challenge the position of their superiors. The radiologists are the heads of radiology departments in Ghana with the radiographers working under them. There is a possibility that vocal radiographers in a focus group might be victimised at work, as such this reduced the likelihood of an interactive process.



One weakness of the study is that it did not include patients. It would have been important to explore the views of patients on role extension and if they placed any importance on who provides a particular service, or whether they are more concerned about the quality of the service. However, due to time and resource constraints, this was not possible. Again, another limitation of the study is that it involved only three sites and these purposively represented the extremes of the case in terms of areas with the highest number of radiologists, the lowest number of radiologists, and one site with no radiologists at all. It may have been useful to explore sites that were midway between the two extremes of the case, which might have given some further insight on the practice of radiology in such areas.

The aims of the research were met through the theoretical generalisation from the data. As the study took place on three sites it cannot be claimed to represent the situation across all of the country, but it could be said to be typical of similar conditions in Ghana.

Another possible weakness of the study is that a choice had to be made between breadth and depth. This is as a result of the fact that very little was previously known of the Ghana situation and therefore a broad exploratory approach was required to minimise the risk of closing down important avenues arbitrarily. This has then led to a wide range of issues, which could not be explored in greater detail. Some of the issues will now require specific follow up work to fully explore. Some of these areas have been recommended for further studies in the section on future research.

## 8.7 Implications for Policy and Practice

- The study findings indicate that there are role extension opportunities in Ghana and that there is a need for a change in policy that allows radiographers to extend their roles. There is, therefore, a need for the government, through the MoH, to explore the options of a change in policy that will make effective use of the skills of all healthcare professionals to better enhance service delivery to the clients. This will require challenging traditional professional boundaries and as such will have to be handled with tact and diplomacy. At the core of all healthcare policy should be an attempt to improve the quality of services and the patient experience. It is therefore important that any policy decisions towards the introduction of role extension should be centred on improving healthcare services.
- It is important that in efforts towards policy formulation via, for example, a consensus event of all key stakeholders, should have clear purpose. The purpose of the event should be to brainstorm the study findings and develop a policy for the introduction and practice of role extension in diagnostic radiography. The delegates invited should include all key stakeholders in healthcare generally. This should include, radiographers, radiologists, medical officers, nurses, other allied health professionals, professional regulatory bodies of healthcare professionals, the MoH, GHS and any other stakeholders as may be deemed necessary. Some relevant questions should be posed to participants that they will be required to vote on. A yes/no or I don't know type of response to the questions might be successful. Guidelines would be formed based on the responses from participants and the consensus event should be reconvened within an agreed timeframe (a

year maybe) and the questions reframed based on the reality on the ground, the responses will inform policy.

- The findings have implications for education. The introduction of role extension will require a review of the curriculum for radiography education at the undergraduate level, this will prepare radiographers adequately for postgraduate education towards role extension. It is critical that radiographers have a solid foundation at the undergraduate level so that building upon it at the postgraduate level will be relatively easy. The other implications for education will be a need for institutions of higher education, in collaboration with key stakeholders, to develop tailor-made postgraduate education for role extension to meet the needs of the local Ghanaian clinical situation.
- Furthermore, there are clinical implications to the study findings. The findings indicate a need to prioritise the issue of unreported radiographs that have the potential of adverse medical outcomes and could result in preventable deaths. The introduction of role extension brings additional responsibilities, these have medico-legal implications for the practice of radiographers. The radiographers will be responsible for their actions and inactions and, as such, they will need to be adequately prepared for the new clinical responsibilities. It is anticipated that role extension will bring about increased job satisfaction for radiographers and with job satisfaction comes an increase in productivity and quality of services. There are also clinical implications to patients in that the quality of radiology should be maintained regardless of whoever is performing the duties. It is expected that patients will see an improvement in the quality of service they receive.

## 8.8 Future research

This study has established that the factors promoting role extension are available in Ghana. It would be important for a baseline study to be conducted, in Ghana, on the ability of radiographers to interpret plain radiographs. This study should cover all regions of the country. The findings from the study can be used as a guide in reviewing the undergraduate curriculum as well as drawing up the curriculum for postgraduate education for role extension.

It would be of interest to the field if future studies could comprehensively assess the procurement of equipment for radiology departments under the MoH/GHS as this was an area of major concern to most radiographers, but this study could not explore the area in more depth. Findings from this study could also inform a change in policy on the way in which equipment is procured within the MoH/GHS.

Again, a study involving service managers or radiology managers to assess the curriculum used for the undergraduate radiography programmes in order to determine whether the curriculum needs to be changed or updated to meet the current and future needs of the profession is essential, as the practice of radiography is continuously changing.

Additionally, a study to explore the reasons for the inability of the AHPC to effectively regulate the practice of the professions it is supposed to regulate, is very critical. This study established some challenges faced by the AHPC but a more in-depth study that explores these challenges will help to streamline regulation of allied health professionals in Ghana and make it more effective. The AHPC has to be effective in regulating the

practice of allied health professionals in order to build the desired confidence in the general public so that it can effectively regulate extended practice.

Towards the end of the study a paper was published from the issues raised in the literature review and it is attached as Appendix L.

## 8.9 Conclusion

### 8.9.1 The study

Role extension in radiography is a well explored topic in international research, however in Ghana, and most of Sub-Saharan Africa, it has been under-researched. This study therefore set out to explore role extension opportunities in diagnostic radiography in Ghana and its possible impact on patient care.

The study used a single case study with multiple sites to explore the views and experiences of radiographers, (in clinical practice, higher education and in policy formulation) radiologists (in both clinical practice and the education of radiographers) and medical officers in clinical practice. The generation of data was from semi-structured interviews of all participants, documentary analysis and also observations. Relevant and available government documents were also reviewed. The data generated were analysed using Braun and Clark (2006) model of thematic analysis which resulted in three key themes being identified, these formed the main findings of the study. The key elements of the findings were discussed in the discussion chapter with reference to the relevant literature.

### 8.9.2 Key findings summary

Challenges to professional practice were a key finding from this study. This finding was across all sites of the study but was more acute in the rural settings. These challenges to professional practice hamper the smooth flow of work and affect the quality of healthcare services. Additionally, some of the challenges also serve as push factors for the introduction of role extension in Ghana. The shortage of radiologists, further compounded by a skewed distribution as has been shown in this study, is one of the major challenges to effective professional practice that also serves as a push factor for the introduction of role extension. As has been established earlier, the few radiologists who do work in Ghana are mainly stationed in the two big cities in the country, Kumasi and Accra. Consequently, this leaves large areas of the country with very few radiologists; or in the case of areas like the Upper West Region, with no radiologists at all. This situation is negatively affecting healthcare delivery. The study also found that factors resulting in a shortage of radiologists include the multiple tasks that some radiologists have to perform, some of which are mainly administrative and, as such, have taken them away from the clinical area thereby reducing the number of radiologists available to work in clinical practice.

Additionally, there was initially a single residency programme for the whole of West Africa which limited the number of residents from each country, however Ghana has started its own residency programme under the Ghana College of Physicians and Surgeons. This has seen an increase in the number of residents each year, but this increase is still woefully inadequate to meet the increase in demand for services.

Agitation by radiographers regarding the introduction of role extension was one of the push factors revealed by this research. The study established that radiographers felt that

the introduction of role extension could bring about more professional autonomy which might also result in increased job satisfaction and improved retention. They stated that the introduction of role extension would improve the quality of care by ensuring that more radiographs were interpreted, this would reduce patient waiting times and possibly reduce the number of interpretation errors. Last but not least in this category was the support that radiographers enjoyed from other healthcare personnel in relation to the introduction of role extension in Ghana. The findings are indicative of the fact that medical officers already seek the opinions of radiographers in image interpretation; especially in places where there are no radiologists and are therefore of the view that if role extension were formally introduced, and if radiographers were given further education, this would help improve healthcare services. There was also considerable support from the radiologists, although the support was not unanimous.

Some findings from the study can broadly be grouped under education and training. The study has established that the current undergraduate curriculum needs to be reviewed to reflect current practice and also, in particular, to prepare radiographers for possible postgraduate education towards role extension. Even though the current curriculum has been reviewed since its introduction, it needs to be continuously reviewed in order to meet the current realities of the profession. If role extension is to be introduced, then the undergraduate curriculum should be reviewed again and strengthened to adequately prepare radiographers for postgraduate studies towards extending their role.

The study also confirmed that programmes of postgraduate level education for role extension should be approved and accredited by a body set up by law. This education should be a balance of academic and clinical components and both should be examined

throughout to determine competency before a radiographer is deemed to have successfully completed the programme. The need to set minimum entry requirements for postgraduate programmes towards role extension was also established. These requirements should include a minimum number of years of clinical experience.

Furthermore, the study findings also included the need to develop policy that will guide the introduction and practice of role extension. It was also established that the need for such policy was due to the fact that without legal backing, radiologists are more likely to resist. Additionally, without government level policy that changes the current scope of practice of radiographers they will not be able to take part in role extension. The process of policy formulation, which includes the need for broad consultation of all key stakeholders to increase the chances of policy success, was established in this research. The findings also included what were deemed to be the ingredients of a good policy on role extension in Ghana. These included the need for regulation; what ought to be regulated and who should be the regulator. The study found that in order for role extension to be successful in Ghana it should be regulated and that such regulation should cover scope of practice, the conditions of service and a rewards package for practitioners as well as, importantly, geographic locations in which they might practice. It is essential that policy regulates where radiographers can practise, otherwise there may be a tendency for radiographers to remain in the big cities. If that happened the very challenges that role extension is seeking to solve will instead be entrenched. Conditions of service, standards and scope of practice also need to be regulated to maintain professional standards. The findings also indicated that possible barriers to the introduction of role extension will be resistance from radiologists, the shortage of



radiographers, and the lack of a national career structure that takes into account educational qualification and responsibilities.

The study established that there is some informal role extension within diagnostic radiographic already, with some medical officers requesting the opinion of radiographers in image interpretation. In some cases, radiographers have also extended their roles into contrast administration, performing specialised examinations such as hysterosalpingography. These informal roles have been developed as a result of the local situation and training has mainly been acquired 'on the job'. Additionally, these findings further indicate that there is an urgent need for role extension and that there are already opportunities for it to happen.

In conclusion, the introduction of role extension in diagnostic radiography will have to be planned for, and adequately regulated, for the desired benefits to be realised. There is a critical mass of support for it from some key healthcare personnel including radiologists and medical officers, which is important. The findings have also indicated the main conditions required for role extension to be successfully introduced and implemented in Ghana, which offers many potential associated benefits such as improved job satisfaction for radiographers, improved radiology services for patients, reduction in patient waiting times and more accurate interpretation of radiographs.

#### **8.10 Contribution to knowledge**

This study sought to explore role extension opportunities in diagnostic radiography and to explore how role extension could be successfully introduced in a low resource country such as Ghana. The study has therefore made a unique contribution to the body of

knowledge on how role extension in diagnostic radiography can be successfully introduced in Ghana in particular, and low resource countries more generally. The findings can be used as a starting point guide that can be adapted to meet local needs towards the successful introduction of role extension in diagnostic radiography in Sub-Saharan Africa. Given that most low resource countries are faced with similar challenges in the health sector, and most countries in sub-Saharan Africa tend to have similar historical and cultural structures, the study findings are likely to be readily translated and acceptable. The potential for improving patient lives and outcomes by the introduction of radiographer role extension in Ghana in particular cannot be overemphasised. This is particularly so given the shortage of radiologists which is exacerbated by various factors enumerated in this thesis, these include a skewed distribution, multiple tasks taken up by the few radiologists available and overworked medical officers without the required training to interpret radiographs.

To the best of my knowledge there is no other piece of research that has explored how to successfully implement role extension in radiography in a low resource setting where professional structures are not yet well developed or robust.

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## Appendix A Ethics approval from School of Healthcare

School of Healthcare Sciences  
Head of School and Dean Professor Heather  
Waterman

*Ysgol Gwyddorau Gofal Iechyd*  
*Pennaeth yr Ysgol a Deon Yr Athrawes Heather Waterman*



11 October 2017

Cardiff University  
Eastgate House  
13<sup>th</sup> Floor  
35 – 43 Newport Road  
Cardiff CF24 0AB  
Tel Ffon: +44 (0)29 20 688559  
Email E-bost [HCAREethics@cardiff.ac.uk](mailto:HCAREethics@cardiff.ac.uk)

Prifysgol Caerdydd  
13<sup>ed</sup> Liawr  
Ty Eastgate  
35 – 43 Heol Casnewydd  
Caerdydd CF24 0AB

*Abdul-Razak Wuni*  
*Cardiff University*  
*School of Healthcare Sciences*

Dear Abdul-Razak Wuni

### **Role extension opportunities in diagnostic radiography, the situation in Ghana and its impact on patient care.**

At its meeting of **10 October 2017**, the School's Research Ethics Committee considered your research proposal. The decision of the Committee is that your work should:

**Pass –and that you proceed with your Research after discussing the reviewers' comments with your supervisor**

The Committee has asked that the lead reviewers' comments be passed onto you and your supervisor, please see below.

Please could you clarify whether you are a manager?  
If you are a manager, please clarify how you manage poor performance

Please note that if there are any subsequent major amendments to the project made following this approval you will be required to submit a revised proposal form. You are advised to contact me if this situation arises. In addition, in line with the University requirements, the project will be monitored on an annual basis by the Committee and an annual monitoring form will be despatched to you in approximately 11 months' time. If the project is completed before this time you should contact me to obtain a form for completion.

Please do not hesitate to contact me if you have any questions.

Yours sincerely

Mrs Liz Harmer – Griebel  
Research Administration Manager

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## Appendix C Participant information sheet



### Appendix C

#### School of Healthcare Sciences

#### College of Biomedical and Life Sciences

#### Participant information sheet for health or social care professionals

#### Role Extension opportunities in Radiography, the situation in Ghana and its impact on patient care.

I am a radiographer of over a decade of experience and would like to invite you to take part in a PhD research study looking at role extension opportunities in radiography in Ghana and how it impacts on the quality of healthcare patients receive. I will like to explain why the study is being done and what it will involve for you before you make a decision on taking part or not.

Please take the time to read the following information carefully. You might want to talk to other people about the study and you may have questions that you want to ask. If you have any questions or want to know more, please contact me on the number at the end of the information sheet.

#### What is this study about?

This study will explore role extension opportunities in radiography in Ghana and its possible impact on patient care. The researcher will seek to explore if there are role extension opportunities in diagnostic radiography in Ghana by conducting in- depth interviews with a cross section of radiographers, radiologist, medical officers, personnel from the Ministry of Health Ghana (MOH) and Allied Health Professions council (AHPC). across the country. These radiographers will be selected based on a criterion. The ministry of health and the allied health professions council will both have a representative each.

#### Why have you been invited to take part?

I am inviting you to take part as you are a radiographer involved in clinical practice, involved in training of radiographers, a radiologist, a staff of a regulatory body (AHPC) or involved in policy making (MOH) for healthcare in Ghana.

#### Do you have to take part?

No. It is entirely your decision to make. If you are interested, I will explain to you what the study involves and take you through the information sheet. After taking you through the information sheet if you still agree to be a part of the study, I will invite you to give your consent form confirming your agreement to be involved in the study. If you decide to withdraw from the study at any point you can do so without having to give any reason for the decision.

**What will happen to you if you take part?**

I will be in touch with you to schedule a day for an interview which will last approximately sixty minutes

The interview will be audio-taped and it can take place at a venue of your choice.

At the interview I will ask you questions relating to the role extension opportunities in radiography, the situation in Ghana and its impact on patient care. These you will be able to discuss. Your practice will also be observed and field notes taken.

**What are the possible disadvantages and risks of taking part in the study?**

There are no significant risks or disadvantages for you if you take part in the study.

Unprofessional conduct that you reveal through the interview may will be reported to the appropriate agency. However, all the material collected for the study will be confidential and when the study is written your name will not be mentioned. Quotes will be included in the report but you cannot be identified from them.

**What are the possible benefits of taking part?**

Taking part in this study will help illuminate the role extension situation in Ghana and its impact on patient care. This may inform or contribute to a change in policy that could bring about roles in radiography being extended. This could result in greater job satisfaction, increased recruitment and retention.

**What will happen to the results of the research study?**

It is important that you know your identity will not be revealed in any publication, conference presentation or PhD study. At the end of the study the results will be published in radiography and medical journals and the study will be presented at radiography and medical conferences. The completed PhD will be submitted to the University and examined both internally and outside of the University. I would like to retain the results of the study with a view to being able to carry out a secondary study, present the findings at conferences and use the materials for teaching with your consent. I will also provide a report of the findings from the study for everyone who takes part. All the information collected in the study will also be privately stored and subsequently destroyed, using the guidance for storing research information set out by Cardiff University.

**Who is organising and funding the research?**

The funding has been arranged so that the study can operate for three years. This funding was awarded by Ghana Education Trust Fund. The study will be supervised by two senior and experienced staff, one of whom is Professor Daniel Kelly and the other Dr Nicholas Courtier.

**Who has reviewed this study?**

The ethics committee of the School of Healthcare studies of Cardiff University reviewed the study and has agreed that the study is ethical.

**Further information and contact details**

You may want some more general or specific information about this study and you may want to talk to other healthcare professionals about participating as they may be in a good position to give you advice about getting involved in the study.

If you decide to take part in the study and you are unhappy at any point about your participation, please contact me.

Thank you for considering taking part in this study. If you need to contact me, you can do so at the e-mail address and number below

Abdul-Razak Wuni

PhD Student

Tel: 0244597115

Email: [Abdul-RazakW@cardiff.ac.uk](mailto:Abdul-RazakW@cardiff.ac.uk)



Appendix D Consent form



Appendix D

**School of Healthcare Sciences**

**College of Biomedical and Life Sciences**

**Title of project: Role extension opportunities in radiography, the situation in Ghana and its impact on patient care.**

**Researcher: Abdul-Razak Wuni**

**Consent form for healthcare or social care professionals**

Please do initial in the space provide at the end of each statement if you agree.

1. I confirm that I have read the information sheet for healthcare professionals (version 1.0 22.02.17) for the above study. I have had the opportunity to consider the information, asked questions and have had these answered satisfactorily.

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without it affecting me.

3. I understand that my interview will be recorded on a digital recording device and my practice will be observed. I give permission for this.

4. I understand that data collected will be anonymised and may be looked at by responsible representatives from Cardiff University for the purposes of monitoring and auditing the conduct of the research. I give permission for this.

5. I understand that data collected will not be transferred to any commercial organisation but may be used anonymously for publication in healthcare journals, presentation at conferences, for teaching purposes and for future studies. This data will be securely stored for a period of 15 years. I give permission for this.

6. I agree to take part in the above study.



## Appendix E

### Interview Guide

#### Medical officers

***Can you start by telling me how long have you been in practice in Ghana?***

Prompts and probes: What does your role involve? Thinking about your practice is there any different from your expectations whilst in school? What are the main challenges you face? Can you explain the impact of these?

***What are your views on radiological services available in this facility?***

Prompts and probes: What are your views on if all radiographs must be reported on or not and why? What do you think of unreported radiographs and is the problem of unreported radiographs a significant one? How significant is it? What could be the cause of unreported radiographs in your view? Does it affect the overall service and how? Can you tell me about the timeliness of the way you get reports on radiographs in order to influence patient management? In your view what causes for any delays in reporting on radiographs?

***What is the most feasible solution in your view given the resource situation in Ghana?***

Prompts and probes: What are your views on radiographers being given the requisite post-graduate training to report on radiographs? Can you tell me more about this, what training is needed, how might they be supported and prepared for this role in the future? What are your views on how extended practice, such as radiograph interpretation, can best be regulated and controlled in Ghana? What three things would you suggest to improve radiography service provision here in Ghana?

**What three things would you suggest to improve radiography service provision here in Ghana?**

Anything else you would like to add about how future services could be developed to meet the needs of the people?

Thank you for your time

**Allied Health Professions Council**

***Can you start by telling me how long the council been in operation?***

Prompts and probes: Can you tell me what the role of the council involves? How does the council go about its work? What are the major challenges the council faces in executing its mandate? Can you explain the impact of these on your work? What sort of assistance will you need to make the council more effective?

***Can you explain how do you handle the issues of unqualified persons practicing?***

Prompts and probes: Can you take me through the process of what happens when a person is caught practicing without the requisite qualification and registration? What

happens to the facility that has employed the services of an unqualified or unregistered person

***Thinking about registration. What is the scope of practice of a diagnostic radiographer at registration?***

Prompts and probes: Have you ever had cases or reports of radiographers performing roles beyond what they have been licensed to perform? Can you take me through what happens if such a case arises?

**What three things would you suggest to improve radiography service provision here in Ghana?**

Anything else you would like to add about how future services could be developed to meet the needs of the people?

Thank you for your time

**Ministry of Health**

***Can you begin by giving me a general overview on the practice of radiology in Ghana?***

Prompts and probes: What are the main challenges of radiology in Ghana? Can you explain to me how these are affecting the quality of radiology services and what is being done about it? What is the staffing policy of the ministry on radiology? What is the ideal radiologists to patient ratio in Ghana? What is the real radiologist to patient ratio in Ghana? What is the cause of the shortage of radiologist? What is the existing

distribution of radiologist across the country per regional distribution? Can you explain the cause of the skewed distribution of radiologist and how it is being tackled?

***Can you explain to me what is the ideal period for emergency or trauma radiographs to get reported on in Ghana by ministry of health?***

Prompts and probes: What is the real period it takes for emergency and trauma radiographs to get reported in Ghana? In your opinion what could be the cause of the delay? What is the ideal period for radiographs to get reported on in Ghana? What is the real period it takes for radiographs to get reported in Ghana? What is the cause of the delay?

***Given the radiologist shortage, unreported films and delay in reporting of radiographs what is the most feasible solution in your view taking into account the resource constraints in Ghana?***

Prompts and probes: Will you consider role extension for radiographers as a way of solving this problem and why? In your opinion how can it be implemented? Thinking of role extension what scope of roles should be extended and what should be the minimum qualification? Who will be involved in training the radiographers for extended roles and how will it be regulated? How will radiographers who extent their roles be placed on the existing structure that has no such provisions? How will the current policy that does not allow radiographers to perform some task cater for the roles that will be extended but currently outlawed by the existing policy?

**What three things would you suggest to improve radiography service provision here in Ghana?**

Anything else you would like to add about how future services could be developed to meet the needs of the people?

Thank you for your time

## **Radiologist**

### ***Can you start by telling me how long have you been practicing as a radiologist?***

Prompts: What motivated you to become a radiologist? Before training as radiologist did you think radiologist were needed and why? Can you give me an overview of what the current staffing situation and pressure of work? What in your view is the reason for the radiologists' shortage? What are the possible causes for the skewed distribution of radiologists and how can it be addressed?

### ***What is your view on all radiographs being reported on?***

Prompts and probes: Why are some radiographs not reported on? How long does it take on the average to have radiographs reported on and why? In your opinion does the time taken for reports to be ready negatively impact on patient management and why? What are your views on the ability of medical officers to correctly interpret radiographs?

### ***What do you see as the most feasible solution to the issues of unreported and delayed reports of radiographs given the resource constraints in Ghana?***

Prompts and probes: What are your views on radiographers being given the requisite post-graduate training to report on radiographs? Can you tell me more about this, what training is needed, what should be the minimum training for role extension, who should

be involved in the training and how long should the training last? How might they be supported and prepared for this role in the future? What are your views on how extended practice, such as radiograph interpretation, can best be regulated and controlled in Ghana? What form of support will you offer for role extension to be successfully implemented and sustained? What should be the standard of proficiency before being allowed to extend roles? What should be the scope of the extended roles?

**What three things would you suggest to improve radiography service provision here in Ghana?**

Anything else you would like to add about how future services could be developed to meet the needs of the people?

Thank you for your time

### **Radiographers**

***Can you start by telling me how many years have u been in practice?***

Prompts and probes: Can you tell me what your role involves? How different is practice from what you thought it will be? What are you challenges in practice? Can you explain the impact of these challenges on your practice? What was your scope of practice at registration? What is your current scope of practice?

***Can you tell me more about radiographs produced in this facility, if they all radiographs get reported on and why?***

Prompts and probes: How long does it take for radiographs to get reported? What in your view is the cause of the delay? Does the delay impact negatively on the way patients are managed? if so how?

***Can you explain to me what you understand by role extension?***

Prompts and probes: With respects to role extension is there the need for it in Ghana and why? What are your views on radiographers being given the requisite post-graduate training to report on radiographs? Can you tell me more about this, what training is needed, what should be the minimum training for role extension, who should be involved in the training and how long should the training last? How might they be supported and prepared for this role in the future? What are your views on how extended practice, such as radiograph interpretation, can best be regulated and controlled in Ghana? What form of support will you offer for role extension to be successfully implemented and sustained? What should be the standard of proficiency before being allowed to extend roles? What should be the scope of the extended roles? Where should the radiographers who extend their roles be placed on the salary structure? What are the factors that promote or inhibit its introduction?

**What three things would you suggest to improve radiography service provision here in Ghana?**

Anything else you would like to add about how future services could be developed to meet the needs of the people?





	<p>government facilities which were almost always over crowded with patients. I cannot say for sure if the attention he paid to each patient was because he had fewer patients or it was just standard practice there, regardless of the number of patients.</p> <p>It was observed that the radiographer was the one who gave any intravenous contrast medium that was needed for the examinations unlike, in the government hospitals where it was done by the radiology residents. It was also observed that the radiographer made notes on the requisition forms the patient brought for the examinations. These notes were observations made whilst performing the examination and were meant for the attention of the radiologists. The radiologist and the radiographer seem to have a very good working relationship and anytime the radiologists found something of interest whilst reporting on an image he would notify the radiographer. The radiographer called in the radiologists in the middle of a head CT scan for a patient to draw his attention to something he had found on the CT that required immediate medical attention. The radiologists immediately got an ambulance and arranged for the patient to be sent to the nearby hospital. He showed gratitude to the radiographer for drawing his attention to it.</p> <p>It was also observed that disposable changing gowns were being used. The charges were significantly higher than in the public sector. Each patient was given both hard copies of the images and soft copies as well. The facility does not accept the national health insurance card but accepts private insurance.</p> <p>The working environment was very different from that of the government hospitals. The environment here was more conducive and comfortable with state of the art equipment and accessories.</p>	<p>Examination room</p>
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## Appendix G In depth Interview of participant in Accra

Code R-researcher I-Interviewee

Interviewer: Abdul-Razak Wuni

R. Good Morning

I. Good Morning

R. This is a study as part of my PhD thesis and it's on role extension opportunities in diagnostic radiography, the situation in Ghana and its impact on patient care. I am interviewing radiographers, radiologists and medical doctors. I seek your consent to interview you and to record the interview to be transcribed later for analysis, if at any point during the study you do feel you don't want to continue with the study you can withdraw, and it will not in any way affect you professionally or personally. Confidentiality and anonymity is assured. Do I have your consent to continue?

I. Yes you have my consent you can go ahead.

*R. Can you begin by giving me a general overview of the practice of radiography in Ghana*

I. From the basic qualification as a radiographer in Ghana which is a first degree now, radiographers enter into the profession as a basic radiographer and they perform the basic duties of a radiographer from general radiography to CT scan and all the other modalities depending on how well trained you are or maybe the opportunities you have with the other imaging modalities. The higher modalities (CT and MRI) are not widespread in the country but most of the teaching hospitals and the regional hospitals we could get general radiography, fluoroscopy, CT scan and some places MRI. So, from the basics most of the basic radiographers will perform general radiography, chest X-ray, extremities and all

the other things that are done concerning either pathology or trauma then as the person progresses from basic to senior radiographer, the person is supposed to assume more responsibilities and is supposed to perform more difficult task and more challenging modalities through senior radiographer to principal radiographer. For most places by the time you are at the principal stage especially, in the district or regional hospitals, you turn to assume some managerial roles. So, people from principal radiographer upwards assume this managerial role quality assurance, radiation protection, policies of the radiology department, equipment acquisition, equipment maintenance, consumable usage and their acquisition, and store management of the unit. So, people who move from principal through deputy chief radiographer to the highest level. I think from the basic you spend 3 years to get promoted to senior and from senior it is 5 years to move to next level and it is same all the way up. Formally we had a two-tier program for training of radiographers, the technician/diploma program and the degree program. For some time now, the lower tier training (technician/diploma) program has been stopped. So basically, in Ghanaian formal training in radiography is the first degree for now. When you come to some of our roles, apart from our basic roles as producing diagnostic images, we also play roles like quality assurance, radiation protection procedures and IV (intravenous) injection of contrast medium. These three I have mentioned need some form of structures training and over a period you acquire that technique, when it comes to quality assurance, there are programs you have to put in place, the daily, the weekly, the monthly quality control activities that must take place so that you are obtaining quality images. Then when it comes to radiation protection, short

programs for radiation protection procedures like those being organised by the Ghana atomic energy commission and the radiation protection institute and sometime the International Atomic Energy Agency (IAEA), we do attend these short courses to acquire some little knowledge. Until recently sonography or ultrasound was something like the preserve of the radiologists, but for now radiographer have gone into it, there is a program going on in Kwame Nkrumah University of Science and Technology (KNUST) that train basic sonographers, so in that case radiographers have now joined in ultrasound imaging. Then apart from KNUST there is a postgraduate program in ultrasound in the University of Ghana, they also have competence in ultrasound imaging. So, these are some of the areas that are moving away from the basic functions of the radiographer. Radiographers also have a very big duty to play when equipment's are being acquired, we have to contribute to the purchase of equipment that are suitable for our situation, be it the size of the facility, the through put, the image quality wise, whether the institution is a tertiary or regional or district level, we also advise in consumable acquisition and management so that you don't go buying anything that is substandard that cannot be used, or which will produce images of lower quality. These are some of the things I will say from our basic to a little bit of our role extension for a radiographer in Ghana.

*R. You mentioned radiation protection and quality assurance as some of the areas radiographers have ventured into, is there a form of structured training for these?*

I. The School Nuclear and Allied sciences of the University of Ghana has postgraduate programs in these and some radiographers have gone through

them, they obtain a postgraduate qualification. These people serve as radiation protection officers in their facilities.

*R. On the issue of radiographers playing a role in purchasing of equipment, is it the case that is what should be done or that is what is done in practice?*

I. It is what is expected, in many places in our Ghanaian setting, a lot of times governments or agencies procure equipment on behalf of the facility, in which case the personnel within the facility don't have a lot of say either intentionally or unintentionally. Sometimes equipment is purchased without the knowledge of radiographers but in some cases, let's say when it comes to korle bu teaching hospital, recently when government was going to acquire equipment I made an input as the chief radiographer so with our experience with a particular brand we recommended that we wanted that brand because it has been a tested brand. That choice was respected so somehow it works sometimes.

*R. In instances where radiographers do not have a say in the kind of equipment that are purchased does it in anyway affect the kind and quality of equipment supplied?*

I. You see sometimes you think of access to equipment, secondly you think about the availability of experts like engineers within that setting, so if maybe for example I am going in for a Philips equipment, I will sit back and say do we have any experience with Philips, are we aware of their level of expertise, do they have accessories and backups, so these are some the things we do, so if you don't seek to analyse these things and you go and buy or somebody imposes an equipment on you, who has very little experience of the items enumerated, then you are bound to face problems

*R. What would you say are the main challenges of radiography in Ghana?*

I. Radiography is not doing so badly in Ghana, we are challenged in certain ways, most of our facilities are government owned, so when you come out as a radiographer, your choice of job is somehow restricted. You are forced into a situation like you are looking for a job so, you don't have too much of a choice. Our level of training is very good, especially when people come from outside of Africa they appreciate our training, recently we had some visitors from the USA, they saw our training as heavily packed, in fact they appreciated our curriculum. The only thing is when you come out of training and you are working, you are restricted in something like your performance, in most places you just perform general radiography. The maintenance of equipment is also very poor which means that you don't have these equipment's functioning throughout the year. I can give you an example of Korle bu teaching hospital whose premium CT scanner Aquilion one has broken down for the past 4 months. A whole teaching hospital, the premier hospital in Ghana, our CT scanner has been down for 4 months and we have not done CT scans for 4 months. It can be very frustrating. So our number one challenge for radiographers in Ghana is equipment acquisition and its maintenance. Recently we had challenges with our power systems, but it has been restored now. We are also challenged in specialization, as a radiographer you are supposed to be an all-rounder, from basic general radiography, to fluoroscopy, CT scan and MRI. We don't have the comfort of specializing in maybe just CT, I am just a CT radiographer or an MRI radiographer, you should be an all-rounder, it is a challenge. So, we don't have

the leeway to specialise and have in-depth knowledge in a particular modality, maybe it is coming from sponsorship for further programs in this specialisation or maybe unavailability of the modalities. These are some of the challenges we have. Then our salary structure too does not favour radiographers, we don't even earn radiation risk allowance in Ghana but for a radiation worker you are supposed to be paid radiation allowance. That radiation risk allowance radiographers in Ghana don't get it.

*R. Why is that so?*

I. I don't know, that is what we came to meet, and we have been struggling over the time for it. In korle bu something has been structured in the form of radiation risk allowance but in reality, it is not. It has been quoted as radiation allowance, but it is something like a motivation. Radiation risk allowance should be a percentage of your salary and this is not.

*R. In this four months that the CT scan has broken down, what happens to patients who need to do a CT scan?*

I. It is so embarrassing to talk about this because somebody who has been brought into emergency, with a stroke situation and a very quick CT scan is needed, then this patient has to be carried away from korle bu to another centre for CT examination and then brought back. It is so embarrassing and very frustrating, one of our biggest challenges and frustration is this equipment maintenance.



*R. How does these problems impact on the quality of radiology services rendered to the clients?*

I. This one I will throw it back to you, because like I was saying, someone has been rushed to the emergency with a stroke and immediately you want to see what is happening inside the brain and we don't have access to a CT scan, so we can't assess what is happening, so it will by all means bring down performance in the whole hospital system. You will just be doing trial and error, you have to do trial and error to save the patient because you don't know for sure what you are doing. For a premier hospital like Korle and for evidence based medical practice in the world now, you should not be doing that. Now CT scan is basic for modern health management.

*R. Does the ministry of health have any policy on maintenance of equipment?*

I. I don't know of any policy from the ministry, all we know is each facility should have equipment management policy for managing their equipment. Depending on whoever is the supplier the facility is to strike a deal as to how to maintain the equipment and it should be part of the equipment acquisition, the maintenance of the equipment should be part of the purchase of the equipment, but we are more interested in seeing the beautiful equipment without even going into the details of its maintenance.

*R. Looking at staffing levels, do you have enough radiographers in Ghana.*

I. In the country I may not be able to say yes or no but if Korle Bu has been short of radiographers for the past 5 years it should give you an indication of

what the situation in the country is like. Korle bu has informed management of the staff needs for the past 5 years but they still have a shortage. The last time radiographers were recruited in korle bu was 5 years ago and since then 7 radiographers have left the system and even at that time before this 7-people left, we had a shortfall in korle bu and it is bad, almost on daily basis you have to go to administration and tell them we need more radiographers, otherwise, the patient through put will have to be cut down, we can't do what we are continuously doing without getting more hands.

*R. With radiologist numbers will you say the number is adequate in korle bu or across the country?*

I. I will not say it's okay all over the country because most radiologists refuse to go to the district and regional hospitals, they all want to be in Accra. The reason I can't answer. Right now, we have about 4 radiologists at Ridge (Accra regional hospital) or even 5, they are challenging Korle bu teaching hospital, korle bu has 7. Why are they all pooling in Accra? There should be a policy by the ministry or the government that if you qualify as a radiologist you should be posted, at least all the regions should have radiologists. Upper east and upper west no radiologists and you go to Ridge hospital and they are 5 radiologists, what are they doing there? You go to Cape Coast and they are 3, I can imagine the level of image production, what is their through put that they will need 3 radiologists in Cape Coast.

*R. What is the ideal time it should take for images to get reported?*

I. The ideal situation is the moment your image is produced you should have your report in a few hours the same day, be it general radiography, CT scan or MRI, you should get your report on the same day.

*R. What is the real situation on the ground?*

I. I would not be able to give accurate timelines for the whole country but in korle bu if you take a general radiograph the report will be ready in 3 days and it is the same for CT scan and MRI as well. That is what is on paper but there are situations where you take your report in one week's time.

*R. What could be the cause of the delay?*

I. I will not say the numbers, I will not attribute it to radiologists' numbers, no I will not, but after that I don't have any further explanation. It is not the work load either. Sometimes the excuse they give is, this is a teaching hospital, residents are learning, so they try to do something to give the residents a leeway to study, to give it a prior study before radiologist will give the final report. So that is the only thing I will assign to the delay.

*R. As a teaching hospital they do have the soft copies of the images they can always come back to with the residents to report.*

I. I agree so it cannot be the real reason for the delays.

*R. Do they operate a system where if you need a report faster than it normally will take you pay and have it done faster?*

I. Yes there is this kind of thing, they have given it the name intra-moral practice, that if you want your case to be reported faster than the normal way, some extra charge is put on your case and you will receive it earlier than normal. Even those ones have challenges, they don't get it within the promised time, but I know there is this kind of intra-moral practice where a charge is put on your case for it to be reported faster.

*R. Given that there is a radiologist's shortage, issues of delayed reporting of films, cases of non-reporting of films and given our peculiar situation in Ghana, what do you see as the most feasible solution to getting all films reported and in good time especially in places without radiologists?*

I. Where there are no radiologists and, yet their cases must be reported, this brings in role extension for radiographers. There are certain basic radiographs that can be reported by the radiographers if they are given a little training, from the basic pattern recognition and if they are given a little training and polishing they can take up these roles and perform very creditably.

*R. In your opinion how do you think role extension can be implemented such that it can be a success?*

I. Role extension, you know if I have my basic role and you want me to extend my role, it means I need to be motivated, so it needs some kind of motivation, motivation not only in monetary terms, it could even be promotions, certification so that people feel that they also belong. They have the recognition that I can also give basic reporting but if I am giving this opinion and I am writing the

reports and there is no recognition, nothing changes, the status quo still remains, then there is no motivation to do it.

*R. What should be the scope of role extension if it is to be introduced?*

I. The ideal thing is providing quality health care so that is the basic thing. If it comes to reporting we just have to make sure that the reports that comes out serves as improving patient healthcare, it should not be just for the fact that we are extending our role, if we are starting role extension it should be done gradually, from one step to another. We can start from basic radiography, we can start from chest X-rays, what are some of the criteria that are used in assessing that this is a quality image, then you go into pathology, differentiating between normal and abnormal. So, we can start from general radiography so that gradually we go into CT scans, we should be able to differentiate between a bleed and an infarct on a CT scan. If you are able to tell the doctor that I can see a micro infarct at this point, it will help the doctor to do his diagnosis, so we should start from the basics and gradually build upon it.

*R. In your response you mentioned training, who do you think should be involved in this training?*

I. Radiologists should be there, senior radiographers and I will even say the senior radiographers because radiographer, radiographer training is more smooth than when you come to radiologist radiographer but when it comes to this kind of reporting thing radiologists should be involved and they should be able to start from basic principles then gradually we build up. So, it should be both radiologists and senior and experienced radiographers.

*R. If radiographers are extending their roles, who and how should this be regulated?*

I. Apart from even the monetary motivation, any person who is identified as given as extended role should be certified, this person should be given a certificate and be recognised that this person is ABC and can take XYZ roles, it should be certified otherwise everybody will say I am a radiographer I have the right to do QRS meanwhile you don't have the training or competence.

*R. Who should do that?*

I. I think the allied health professions council should be able to do that.

*R. You mentioned motivation, with role extension comes additional training and qualification, which comes with additional responsibilities, naturally anyone will expect that to come with additional rewards in terms of remuneration. What will you suggest for people to placed on the salary structure or there should be a new structure for people who have extended their roles?*

I. You know in pharmacy, they have this thing called specialist pharmacist, I don't know the program they do to acquire it, but I know it is after specialising in certain fields of their program and the same thing can be done for radiography. Specialist radiographer (CT scan) which means you have acquired deeper knowledge in CT scan, so you are recognised as such, such person should be captured by the council, from the initial stages this thing should be structured and sent to the ministry of health so that the pay structure can be adjusted to capture these positions so that they are bunched together, whether you are a CT scan specialist or not you are a radiographer.

*R. Currently the policy does not allow radiographers to take certain task, for example radiographers are not allowed to report on radiographs, if role extension is to cover areas radiographers are currently not allowed by law to get into what will you suggest be done?*

I. If a radiographer has gone through training for let's use the CT scan example, and he is a specialist radiographer (CT scan), this person is designated as someone who can do ABC and this should be captured by the allied health professions council and this should be approved by the ministry so that it becomes an existing document so that you know that if I go out to do ABC, Sometimes I was doing MRI, I did the postgraduate diploma at Anglia Ruskin, I was saying if after this program I am radiographer (MRI) what other salary do I earn, I don't earn it, it is only that I have acquired the knowledge to practice, I am not placed on any other special structure, unless this structure is rebuilt or re-structured that even if you are a radiographer who is qualified to report, you should be designated as radiographer qualified to give a report, and the moment you are captured that way, your place is recognised.

*R. Does it serve as a demotivation when people acquire further training but not accounted for by salary?*

I. For now it is a demotivation that is why anyone who goes out to do a master's program move on to the academia instead staying in the clinical area because that is where they will get their recognition. Once you are within the clinical setting even if you have done PhD in MRI, you are still a radiographer, the system does not recognise the PhD in the clinical area. Whereas in the academia

it will be recognised, so in the clinical setting it is a demotivation. There is this guy who started his master's in MRI just when I finished and when he finished he moved into academia. He is now at university of Cape Coast. I can count a lot of people who have moved into academia after their master's, even you, am sure when you finish you will get into the academia.

*R. What three things will you suggest to improve radiography services in Ghana?*

I. Setting up of imaging facilities, it is coming up gradually, especially in the metropolitan areas, you see a lot imaging centres springing up all over the place. It is a big motivation even that will give people the choice of working at different places at the same time. In the government setting equipment acquisition and their maintenance is very important. The salary structure and the incorporation of radiation risk allowance, we are not earning radiation risk allowance, even radiation monitoring, we are not being monitored, Ghana Atomic Energy Commission (GAEC) for the past 4 months they say their machines have broken down. So, no Ghanaian radiographer is being monitored for now, it is a demotivation, no radiation worker should work without being monitored, GAEC and Radiation Protection Institute (RPI), they have the sole responsibility to monitor us, their equipment is broken down for the past 4 months, they are trying to acquire one from Vienna in Austria and up to now. So, as we are now we are working without being monitored. Getting it from Vienna means it not something will be solved soon because they have to ship it and come and install it and calibrate it before it can be used. They have written to us that they are sorry, and it is a national problem, because they monitor every radiation worker,



so it is a demotivation for radiographers, you can't be walking inside radiation and it is not coloured or visible to the eye, when it is hitting you, you don't know that radiation is hitting you.

*R. Anything else you will like to add?*

I. Like I have said already all the demotivation factors should be removed, radiation protection should be key, a lot of people runaway from radiation work because they know the harmful effects of radiation so if you have chosen to be in that profession and you are not monitored, it is dangerous. Modern equipment and imaging systems like direct digital systems to do away with all analogue equipment then we will get there.

*R. Thank you very much for your time*

I. you are most welcome.

Appendix H- Sample thematic analysis of a transcript

Data Item	Codes	Subthemes	Themes
<p>From the basic qualification as a radiographer in Ghana which is a first degree now, radiographers enter into the profession as a basic radiographer and they perform the basic duties of a radiographer from general radiography to CT scan and all the other modalities depending on how well trained you are or maybe the opportunities you have with the other imaging modalities. The higher modalities (CT and MRI) are not widespread in the country but most of the teaching hospitals and the regional hospitals we could get general radiography, fluoroscopy, CT scan and some places MRI. So, from the basics most of the basic radiographers will perform general radiography, chest X-ray, extremities and all the other things that are done concerning either pathology or trauma then as the person progresses from basic to senior radiographer, the person is supposed to assume more</p>	Basic qualification	Radiography education	Education and training
	Equipment distribution	Skewed distribution radiologist	Challenges to Professional practice
	Duties	Radiography	Challenges to Professional practice
	Hierarchy	Radiographer professional ambition	Challenges to Professional practice

<p>responsibilities and is supposed to perform more difficult task and more challenging modalities through senior radiographer to principal radiographer. For most places by the time you are at the principal stage especially, in the district or regional hospitals, you turn to assume some managerial roles. So, people from principal radiographer upwards assume this managerial role quality assurance, radiation protection, policies of the radiology department, equipment acquisition, equipment maintenance, consumable usage and their acquisition, and store management of the unit. So, people who move from principal through deputy chief radiographer to the highest level. I think from the basic you spend 3 years to get promoted to senior and from senior it is 5 years to move to next level and it is same all the way up. Formally we had a two-tier programme for training of radiographers, the technician/diploma programme and the degree programme. For some time now, the lower tier</p>	<p>Extended role</p>	<p>Evidence of role extension</p>	<p>Challenges to Professional practice</p>
<p>radiation protection, policies of the radiology department, equipment acquisition, equipment maintenance, consumable usage and their acquisition, and store management of the unit. So, people who move from principal through deputy chief radiographer to the highest level. I think from the basic you spend 3 years to get promoted to senior and from senior it is 5 years to move to next level and it is same all the way up. Formally we had a two-tier programme for training of radiographers, the technician/diploma programme and the degree programme. For some time now, the lower tier</p>	<p>Extended role</p>	<p>Evidence of role extension</p>	<p>Challenges to Professional practice</p>
<p>Formally we had a two-tier programme for training of radiographers, the technician/diploma programme and the degree programme. For some time now, the lower tier</p>	<p>Structure/ Hierarchy</p>	<p>Career structure</p>	<p>Challenges to Professional practice</p>
<p>and the degree programme. For some time now, the lower tier</p>	<p>education</p>	<p>History of radiography education</p>	<p>Education and training</p>

<p>training (technician/diploma) program has been stopped. So basically, in Ghana formal training in radiography is the first degree for now. When you come to some of our roles, apart from our basic roles as producing diagnostic images, we also play roles like quality assurance, radiation protection procedures and IV (intravenous) injection of contrast medium. These three I have mentioned need some form of structures training and over a period you acquire that technique, when it comes to quality assurance, there are programs you have to put in place, the daily, the weekly, the monthly quality control activities that must take place so that you are obtaining quality images. Then when it comes to radiation protection, short programmes for radiation protection procedures like those being organised by the Ghana atomic energy commission and the radiation protection institute and sometime the International Atomic Energy Agency (IAEA), we do attend these short courses to</p>	<p>Basic qualification</p> <p>Extended roles</p> <p>Training</p> <p>Training</p>	<p>Radiography education</p> <p>Evidence role extension</p> <p>CPD</p> <p>CPD</p>	<p>Education and training</p> <p>Challenges to professional practice</p> <p>Education and training</p> <p>Education and training</p>
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<p>acquire some little knowledge.</p> <p>Until recently sonography or ultrasound was something like the preserve of the radiologists, but for now radiographer have gone into it, there is a programme going on in Kwame Nkrumah University of Science and Technology (KNUST) that train basic sonographers, so in that case radiographers have now joined in ultrasound imaging. Then apart from KNUST there is a postgraduate programme in ultrasound in the University of Ghana, they also have competence in ultrasound imaging. So, these are some of the areas that are moving away from the basic functions of the radiographer. Radiographers also have a very big duty to play when equipment's are being acquired, we have to contribute to the purchase of equipment that are suitable for our situation, be it the size of the facility, the through put, the image quality wise, whether the institution is a tertiary or regional or district level, we also advise in consumable</p>	Role extension	Evidence of role extension	Challenges to professional practice
	Education	Education	Education and training
	Education	Education	Education and training
	Procurement	Equipment procurement	Challenges to professional practice
	Procurement	Equipment procurement	Challenges to professional practice
	Equipment	Procurement	Challenges to professional practice

<p>acquisition and management so that you don't go buying anything that is substandard that cannot be used, or which will produce images of lower quality. These are some of the things I will say from our basic to a little bit of our role extension for a radiographer in Ghana.</p>			
<p>The School Nuclear and Allied sciences of the University of Ghana has postgraduate programmes in these and some radiographers have gone through them, they obtain a postgraduate qualification. These people serve as radiation protection officers in their facilities.</p>	<p>Education</p> <p>Extended roles</p>	<p>Radiography education</p> <p>Evidence of role extension</p>	<p>Education and training</p> <p>Challenges to professional practice</p>
<p>It is what is expected, in many places in our Ghanaian setting, a lot of times governments or agencies procure equipment on behalf of the facility, in which case the personnel within the facility don't have a lot of say either intentionally or unintentionally. Sometimes equipment is purchased without the knowledge of radiographers but in some</p>	<p>Procurement</p> <p>No consultation</p> <p>No input</p> <p>Input made</p>	<p>Equipment procurement</p> <p>Equipment procurement</p> <p>Equipment procurement</p>	<p>Challenges to professional practice</p> <p>Challenges to professional practice</p> <p>Challenges to professional practice</p>

<p>cases, let's say when it comes to korle bu teaching hospital, recently when government was going to acquire equipment I made an input as the chief radiographer so with our experience with a particular brand we recommended that we wanted that brand because it has been a tested brand. That choice was respected so somehow it works sometimes.</p> <p>You see sometimes you think of access to equipment, secondly you think about the availability of experts like engineers within that setting, so if maybe for example I am going in for a Philips equipment, I will sit back and say do we have any experience with Philips, are we aware of their level of expertise, do they have accessories and backups, so these are some the things we do, so if you don't seek to analyse these things and you go and buy or somebody imposes an equipment on you, who has very little experience of the items</p>	<p>Procurement</p> <p>Input made</p> <p>Recommendation</p> <p>Variables</p> <p>Imposition</p>	<p>Equipment procurement</p> <p>Equipment procurement</p> <p>Equipment procurement</p> <p>Equipment procurement</p> <p>Equipment procurement</p> <p>Equipment procurement</p>	<p>Challenges to professional practice</p> <p>Challenges to professional practice</p> <p>Challenges to professional practice</p> <p>Challenges to professional practice</p> <p>Challenges to professional practice</p> <p>Challenges to professional practice</p>
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<p>enumerated, then you are bound to face problems</p> <p>Radiography is not doing so badly in Ghana, we are challenged in certain ways, most of our facilities are government owned, so when you come out as a radiographer, your choice of job is somehow restricted. You are forced into a situation like you are looking for a job so, you don't have too much of a choice. Our level of training is very good, especially when people come from outside of Africa they appreciate our training, recently we had some visitors from the USA, they saw our training as heavily packed, in fact they appreciated our curriculum. The only thing is when you come out of training and you are working, you are restricted in something like your performance, in most places you just perform general radiography. The maintenance of equipment is also very poor which means that you don't have these equipment's functioning throughout the year. I can give you an example of Korle bu teaching</p>	<p>Ownership</p> <p>Choice</p> <p>Choice</p> <p>Education</p> <p>Challenge</p> <p>Challenge</p> <p>Maintenance</p> <p>Broken equipment</p>	<p>Challenge</p> <p>Challenge</p> <p>Radiography education</p> <p>Restrictions</p> <p>Restrictions</p> <p>Equipment procurement</p>	<p>Challenge to professional practice</p> <p>Challenge to professional practice</p> <p>Educational and training</p> <p>Challenge to professional practice</p> <p>Challenge to professional practice</p> <p>Challenges to professional practice</p>
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<p>hospital whose premium CT scanner aquilion one has broken down for the past 4 months. A whole teaching hospital, the premier hospital in Ghana, our CT scanner has been down for 4 months and we have not done CT scans for 4 months. It can be very frustrating. So our number one challenge for radiographers in Ghana is equipment acquisition and its maintenance. Recently we had challenges with our power systems, but it has been restored now. We are also challenged in specialization, as a radiographer you are supposed to be an all-rounder, from basic general radiography, to fluoroscopy, CT scan and MRI. We don't have the comfort of specializing in maybe just CT, I am just a CT radiographer or an MRI radiographer, you should be an all-rounder, it is a challenge. So, we don't have the leeway to specialise and have in-depth knowledge in a particular modality, maybe it is coming from sponsorship for further programmes in this specialisation or maybe unavailability of the</p>	Frustration	Equipment procurement	Challenges to professional practice
	Challenge	Equipment procurement	Challenges to professional practice
	Challenge	Equipment procurement	Challenges to professional practice
	Jack of all trades	Education	Challenges to professional practice
	No specialisation	workload	Challenges to professional practice
	No specialisation	Radiographer shortage	Challenges to professional practice
	Challenge	Education	Challenges to professional practice
	Challenge	Education/ equipment	Education and Training/ Challenges to professional practice
	Challenge		

<p>modalities. These are some of the challenges we have. Then our salary structure too does not favour radiographers, we don't even earn radiation risk allowance in Ghana but for a radiation worker you are supposed to be paid radiation allowance. That radiation risk allowance radiographers in Ghana don't get it.</p>	<p>Challenge</p>	<p>Career structure  Radiographer professional ambition</p>	<p>Challenges to professional practice  Challenges to professional practice</p>
<p>I don't know, that is what we came to meet, and we have been struggling over the time for it. In korle bu something has been structured in the form of radiation risk allowance but in reality, it is not. It has been quoted as radiation allowance, but it is something like a motivation.</p>	<p>Improvisation</p>	<p>Radiographer professional ambition</p>	<p>Challenges to professional practice</p>
<p>Radiation risk allowance should be a percentage of your salary and this is not.</p> <p>It is so embarrassing to talk about this because somebody who has been brought into emergency, with a stroke situation and a very quick CT scan is needed, then this patient has to be carried away</p>	<p>Equipment breakdown</p>	<p>Equipment procurement</p>	<p>Challenges to professional practice</p>

<p>from korle bu to another centre for CT examination and then brought back. It is so embarrassing and very frustrating, one of our biggest challenges and frustration is this equipment maintenance.</p>	Maintenance	Equipment procurement	Challenges to professional practice
<p>This one I will throw it back to you, because like I was saying, someone has been rushed to the emergency with a stroke and immediately you want to see what is happening inside the brain and we don't have access to a CT scan, so we can't asses what is happening, so it will by all means bring down performance in the whole hospital system. You will just be doing trial and error, you have to do trial and error to safe the patient because you don't know for sure what you are doing. For a premier hospital like korle and for evidence based medical practice in the world now, you should not be doing that. Now CT scan is basic for modern health management</p>	Quality of care	Equipment procurement	Challenges to professional practice
<p>I don't know of any policy from the ministry, all we know is each</p>	Policy policy	Equipment procurement Equipment procurement	Challenges to professional practice Challenges to professional practice

<p>facility should have equipment management policy for managing their equipment. Depending on whoever is the supplier the facility is to strike a deal as to how to maintain the equipment and it should be part of the equipment acquisition, the maintenance of the equipment should be part of the purchase of the equipment, but we are more interested in seeing the beautiful equipment without even going into the details of its maintenance.</p> <p>In the country I may not be able to say yes or no but if korle bu has been short of radiographers for the past 5 years it should give you an indication of what the situation in the country is like. Korle bu has informed management of the staff needs for the past 5 years but they still have a shortage. The last time radiographers were recruited in korle bu was 5 years ago and since then 7 radiographers have left the system and even at that time before this 7-people left, we had a shortfall in korle bu and it is bad, almost on daily basis you have to</p>	Procurement	Equipment procurement	Challenges to professional practice
	Maintenance	Equipment procurement	Challenges to professional practice
	Radiographers	Shortage of radiographers	Challenges to professional practice
	Recruitment	Shortage of radiographers	Challenges to professional practice
	Attrition	Shortage of radiographers	Challenges to professional practice

<p>go to administration and tell them we need more radiographers, otherwise, the patient through put will have to be cut down, we can't do what we are continuously doing without getting more hands.</p> <p>I will not say it's okay all over the country because most radiologists refuse to go to the district and regional hospitals, they all want to be in Accra. The reason I can't answer. Right now, we have about 4 radiologists at Ridge (Accra regional hospital) or even 5, they are challenging Korle bu teaching hospital, korle bu has 7. Why are they all pooling in Accra? There should be a policy by the ministry or the government that if you qualify as a radiologist you should be posted, at least all the regions should have radiologists. Upper east and upper west no radiologists and you go to Ridge hospital and they are 5 radiologists, what are they doing there? You go to Cape Coast and they are 3, I can imagine the level of image production, what is their</p>	<p>Workload</p> <p>Radiologists shortage</p> <p>Skewed</p> <p>Skewed</p> <p>Policy</p> <p>Skewed</p> <p>Skewed</p>	<p>Workload</p> <p>Radiologists shortage</p> <p>Radiologists shortage</p> <p>Radiologists shortage</p> <p>Radiologists shortage</p> <p>Radiologists shortage</p> <p>Radiologists shortage</p> <p>Radiologists shortage</p>	<p>Challenges to professional practice</p> <p>Challenges to professional practice</p> <p>Challenges to professional practice</p> <p>Challenges to professional practice</p> <p>Challenges to professional practice</p> <p>Challenges to professional practice</p> <p>Challenges to professional practice</p>
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<p>through put that they will need 3 radiologists in Cape Coast</p> <p>The ideal situation is the moment your image is produced you should have your report in a few hours the same day, be it general radiography, CT scan or MRI, you should get your report on the same day</p> <p>I would not be able to give accurate timelines for the whole country but in korle bu if you take a general radiograph the report will be ready in 3 days and it is the same for CT scan and MRI as well. That is what is on paper but there are situations where you take your report in one weeks' time.</p> <p>I will not say the numbers, I will not attribute it to radiologists' numbers, no I will not, but after that I don't have any further explanation. It is not the work load either. Sometimes the excuse they give is, this is a teaching hospital, residents are learning, so they try to do something to give the residents a leeway to study, to</p>	<p>Report time</p> <p>Report time</p> <p>Reports</p> <p>workload</p>	<p>Shortage of radiologists</p> <p>Shortage of radiologists</p> <p>Shortage of radiologists</p> <p>Shortage of radiologists</p>	<p>Challenges to professional practice</p> <p>Challenges to professional practice</p> <p>Challenges to professional practice</p> <p>Challenges to professional practice</p>
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<p>give it a prior study before radiologist will give the final report. So that is the only thing I will assign to the delay.</p>	Reasons	Shortage of radiologists	Challenges to professional practice
<p>I agree so it cannot be the real reason for the delays</p>	Reasons	Shortage of radiologists	Challenges to professional practice
<p>Yes there is this kind of thing, they have given it the name intra-moral practice, that if you want your case to be reported faster than the normal way, some extra charge is put on your case and you will receive it earlier than normal.</p>	Report time	Shortage of radiologists	Challenges to professional practice
<p>Even those ones have challenges, they don't get it within the promised time, but I know there is this kind of intra-moral practice where a charge is put on you case for it to be reported faster</p>	Report time	Shortage of radiologists	Challenges to professional practice
<p>Where there are no radiologists and, yet their cases must be reported, this brings in role extension for radiographers. There</p>	Unreported radiographs	Radiologists shortage	Challenges to professional practice
<p>are certain basic radiographs that can be reported by the radiographers if they are given a little training, from the basic pattern recognition and if they are</p>	Role extension	Education	Education and training

<p>given a little training and polishing they can take up these roles and perform very creditably.</p>			
<p>Role extension, you know if I have my basic role and you want me to extend my role, it means I need to be motivated, so it needs some kind of motivation, motivation not only in monetary terms, it could even be promotions, certification so that people feel that they also belong. They have the recognition</p>	<p>Motivation</p>	<p>Ingredients of policy for role extension</p>	<p>Policy planning</p>
<p>that I can also give basic reporting but if I am giving this opinion and I am writing the reports and there is no recognition, nothing changes, the status quo still remains, then there is no motivation to do it.</p>	<p>Recognition</p>	<p>Ingredients of policy for role extension</p>	<p>Policy planning</p>
<p>The ideal thing is providing quality health care so that is the basic thing. If it comes to reporting we just have to make sure that the reports that comes out serves as improving patient healthcare, it should not be just for the fact that</p>	<p>Improved healthcare</p>	<p>Role extension</p>	<p>Policy planning</p>
<p>we are extending our role, if we are starting role extension it should be done gradually, from</p>	<p>Gradual</p>	<p>Role extension</p>	<p>Policy planning</p>
<p>one step to another. We can start</p>	<p>Gradual start</p>		



<p>from basic radiography, we can start from chest X-rays, what are some of the criteria that are used in assessing that this is a quality image, then you go into pathology, differentiating between normal and abnormal. So, we can start from general radiography so that gradually we go into CT scans, we should be able to differentiate between a bleed and an infarct on a CT scan. If you are able to tell the doctor that I can see a micro infarct at this point, it will help the doctor to do his diagnosis, so we should start from the basics and gradually build upon it.</p> <p>Radiologists should be there, senior radiographers and I will even say the senior radiographers because radiographer, radiographer training is more smooth than when you come to radiologist radiographer but when it comes to this kind of reporting thing radiologists should be involved and they should be able to start from basic principles then gradually we build up. So, it should</p>	<p>Gradual</p> <p>Basics</p> <p>Stakeholders</p> <p>Education</p> <p>Education</p>	<p>Role extension</p> <p>Role extension</p> <p>Role extension</p> <p>Role extension</p> <p>Role extension</p>	<p>Policy planning</p> <p>Policy planning</p> <p>Policy planning</p> <p>Policy planning</p> <p>Policy planning</p>
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<p>be both radiologists and senior and experienced radiographers.</p>		<p>Role extension</p>	<p>Policy planning</p>
<p>Apart from even the monetary motivation, any person who is identified as given as extended role should be certified, this person should be given a certificate and be recognised that this person is ABC and can take XYZ roles, it should be certified otherwise everybody will say I am a radiographer I have the right to do QRS meanwhile you don't have the training or competence.</p>	<p>Certification</p>		
	<p>Recognition</p>	<p>Regulation</p>	<p>Policy planning</p>
	<p>Certification</p>	<p>Regulation</p>	<p>Policy planning</p>
	<p>Regulation</p>	<p>Regulation</p>	<p>Policy planning</p>
<p>You know in pharmacy, they have this thing called specialist pharmacist, I don't know the programme they do to acquire it, but I know it is after specialising in certain fields of their programme and the same thing can be done for radiography. Specialist radiographer (CT scan) which means you have acquired deeper knowledge in CT scan, so you are recognised as such, such person should be captured by the council,</p>	<p>Specialisation</p>		
	<p>Specialisation</p>	<p>Career Structure</p>	<p>Policy planning</p>
<p>from the initial stages this thing should be structured and sent to</p>	<p>Structures</p>	<p>Career structure</p>	<p>Policy planning</p>

<p>the ministry of health so that the pay structure can be adjusted to capture these positions so that they are bunched together, whether you are a CT scan specialist or not you are a radiographer.</p>	structure	Career structure	Policy planning
<p>If a radiographer has gone through training for let's use the CT scan example, and he is a specialist radiographer (CT scan), this person is designated as someone who can do ABC and this should be captured by the allied health professions council and this should be approved by the ministry so that it becomes an existing document so that you know that if I go out to do ABC, Sometimes I was doing MRI, I did the postgraduate diploma at Anglia Ruskin, I was saying if after this programme I am radiographer (MRI) what other salary do I earn, I don't earn it, it is only that I have acquired the knowledge to practice, I am not placed on any other special structure, unless this structure is rebuilt or re-structured that even if you are a radiographer</p>	Policy	Career structure	Policy planning
<p>I go out to do ABC, Sometimes I was doing MRI, I did the postgraduate diploma at Anglia Ruskin, I was saying if after this programme I am radiographer (MRI) what other salary do I earn, I don't earn it, it is only that I have acquired the knowledge to practice, I am not placed on any other special structure, unless this structure is rebuilt or re-structured that even if you are a radiographer</p>	Structure	Career structure	Policy planning

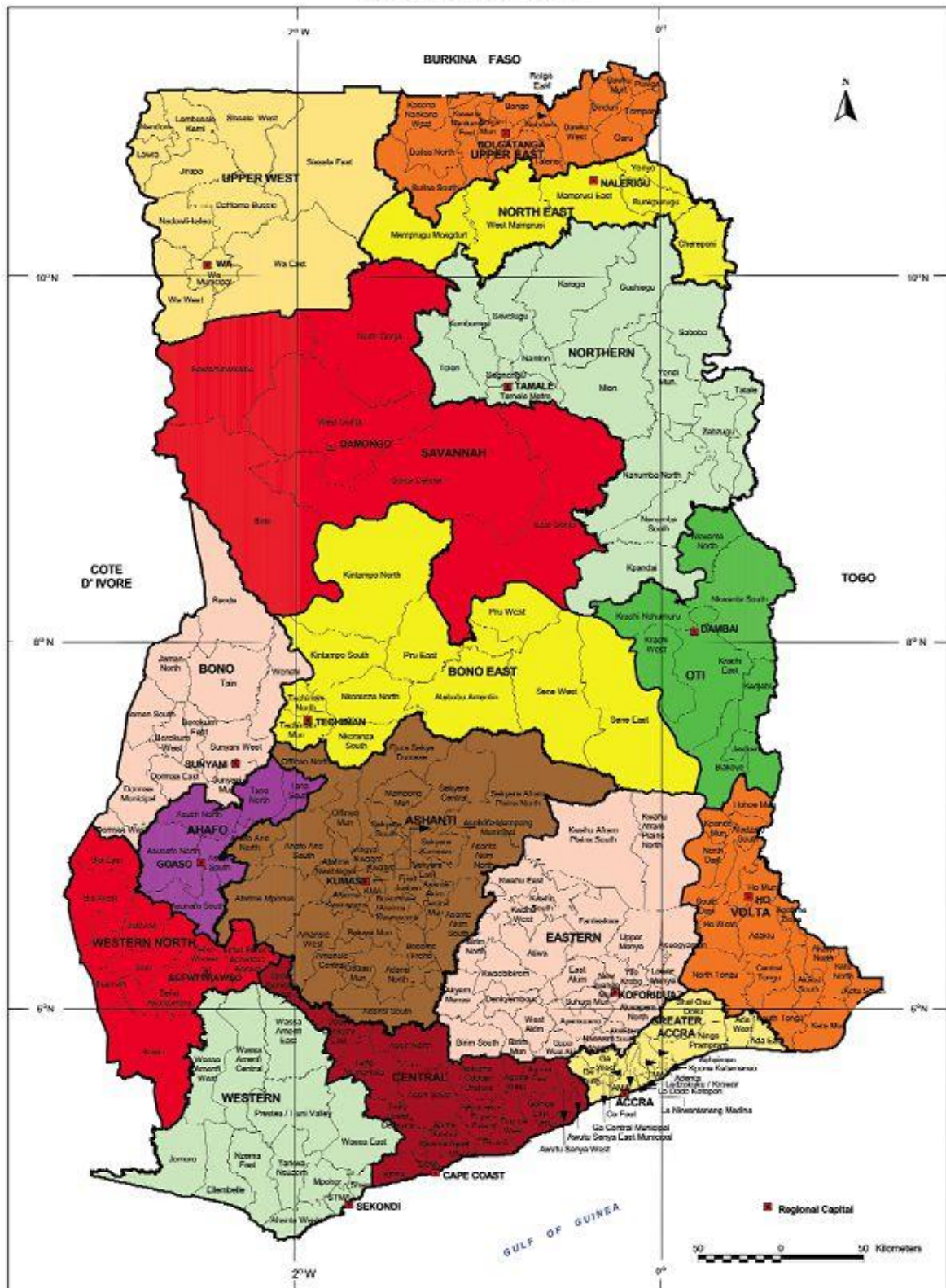
<p>who is qualified to report, you should be designated as radiographer qualified to give a report, and the moment you are captured that way, your place is recognised.</p>	<p>Designation</p>	<p>Career structure</p>	<p>Policy planning</p>
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Appendix I List and title of documents reviewed.

Document type	Title	Date
Act of parliament	Health professions regulatory bodies Act 857	2013
Draft legislative instrument	Technical draft legislative instrument for the health professions regulatory bodies Act 857	2013
Salary structure	Single spine salary structure by grade and category	January, 2018
Official letter	Lack of qualified radiographers to operate X-ray equipment under the 'Accelerated Tuberculosis case detection in Ghana project'	30 <sup>th</sup> June, 2017
Official letter	Alternative arrangement to address lack of qualified radiographers to operate X-ray equipment under accelerated Tuberculosis case detection in Ghana project	19 <sup>th</sup> July, 2017
Official Letter	RE: Alternative arrangement to address lack of qualified radiographers to operate X-ray equipment under accelerated Tuberculosis case detection in Ghana project	12 <sup>th</sup> September, 2017
Official letter	Request of training of staff in X-ray	28 February, 2018
Official letter	Invitation to a meeting to address shortage of radiographer	5 <sup>th</sup> March, 2018
Official letter	Reminder submission of concerns on single spine grade structure	13 <sup>th</sup> March, 2018
Official letter	Radiation dose monitoring of radiographers	5 <sup>th</sup> April, 2018
Official Letter	Attracting and retaining medical officers in Western Region	10 <sup>th</sup> April, 2018
Official letter	Radiographers monitoring device	8 <sup>th</sup> May, 2018
Official letter	Notification of institutions accredited to provide dosimetry services	23 <sup>rd</sup> May, 2018

Official letter	Fallout from the strike action of the Ghana Association of Medical Laboratory Scientists	30 <sup>th</sup> May, 2018
Official letter	Amendment of Ghana Health Service and Teaching hospitals Act 525 1996	14 <sup>th</sup> June, 2018
Official letter	Implementation of signed conditions of service for health workers	30 <sup>th</sup> July, 2018

Appendix J New map of Ghana with 16 regions  
GHANA IN PERSPECTIVE



Source: Ghana Statistical Service, Geographical Information Systems (GIS) Section

## Appendix K Reflections of researcher.

### Interview with PA2

The interview had been scheduled to take place at the office of the participant at 9am. I arrived at the office before he did, I introduced myself and was shown to the waiting area. He arrived 15 mins late, took me to his office where he started a conversation whilst I was setting up for the interview. He was complaining about the workload he had to deal with as a radiologist and the fact that he had some other hospitals he regularly visited to report on images. I asked if he was paid for visiting the other hospitals, to which he answered in the affirmative but added that the stress resulting from having to visit other hospitals is getting to him and was thus planning to cut down on the number of times he visited other hospitals. My Concern was, what will happen if he reduced the number of times he visited those hospitals and he said it will just take longer for their images to get interpreted. I finished setting up and ready to start the interview.

I was worried at the start of the interview that we might be interrupted since he is the only radiologist at the hospital, coupled with the fact that he insisted every scan the sonographer does must be reviewed by himself before the is issued. I kept wondering why he would have to review all the ultrasound reports from the sonographer before they are despatched but I decided I will get an opportunity to ask him about it in the interview.



When I asked him during the interview he remarked they don't have a medical background and as such there are some important details they might leave out hence the need to review each report. Upon reflection I feel I should have asked him why they are registered to practice as sonographers when they do not have the competence to do so according to him.

However in my interaction with the radiographer in the same hospital he argued that it was just a matter of trying to protect his territory, because the radiologists was the only one that used to do ultrasound scans in the hospital and that the sonographers had started work less than 6 months ago. He felt the radiologists was finding it hard to let go of some of his previous responsibilities.

The interview started on a very relaxed note as the researcher was familiar with the interviewee. This familiarity however did not influence the conduct of the interview or the responses given by the interviewee. He had very strong views on issues, though sometimes without any evidence to back his assertions. The interview itself was interrupted a number of times for him to review ultrasound reports before they are despatched. At a point in the interview he also asked for the recorder to be paused because he wanted to say something off record. I was surprised he had an opinion that he wanted to share with me but didn't want it to be on record. That was intriguing.

Earlier in the interview he sought to establish the fact that medical officers were not in the position to interpret radiographs correctly. His argument was that as a medical officer in the Emergency Department (ED), he was faced with several situations where he and the rest of his colleagues were completely lost with some of the radiographs they encountered because their training was not for them to be responsible for image interpretation. He further argued that it was this difficulty that he faced at ED as a medical officer that motivated him to specialise in radiology so that he could help with image interpretation.

He expressed worry about the numbers of radiographs that have to be interpreted by medical officers and the possibility of misinterpretations which could lead to misdiagnosis and subsequent mismanagement or non-treatment of patients. He seemed very concerned and felt that it could actually be leading to many needless deaths. My fears were more with those who interpret the images and actually believe they 'know what they are doing' and are not open to seeking for a second opinion to better guide treatment.

As the interview progressed he began to contradict himself. He for instance argued that the radiographers he works with in the same hospital are very good with image interpretation and anytime they drew his attention to anything on a radiograph it was almost always right. He said he believed radiographers would have been taught anatomy in school and he suspects those radiographers working with him would have been good

in school and hence their ability to give indications of conditions on radiographs. However when he was asked if radiographers could be given the requisite training to interpret some images, he insisted that without a medical background it is impossible to interpret images correctly because, according to him, some of the images had 'medical implications'.

Asked if his radiographers could interpret radiographs if given the required training, he answered in the affirmative but was quick to add that they are an exception. Asked how he came to that conclusion he said he could feel it. It became obvious that there was more to his objection in supporting the idea of radiographers being trained to interpret images than their inability to interpret images accurately.

He for instance said that he felt the anatomy taught to radiographers in their education was not up to scratch, when asked if he had seen the curriculum for undergraduate radiographer education, he said no but he just knew it was not up to the standards of the medical students. It just felt like a professional trying so hard to protect their profession and making arguments that they do not really have the facts to support.

Interestingly, when he was asked what could be done to convince him that radiographers can interpret radiographs, his contention was that all practising radiographers should be exempted from that program because he believed the anatomy they studied at the undergraduate level was not enough to be built upon. He advocated that the undergraduate curriculum should be reviewed and anatomy and pathology be

strengthened to the level of the medical students. Once these were done, the graduates from that program can then be given further education in the form of apprenticeship with a radiologist mentor to interpret radiographs.

He admitted he had not seen the curriculum used for undergraduate radiographer education but was advocating for it to be strengthened. Never mind that he had no idea of the course content but in his view, it should be strengthened. I could not help but feel this was all an attempt to introduce conditions that he felt might frustrate prospective radiographers from venturing into his “space”. Asked if he was ready to serve as a radiologist mentor to radiographers that have been educated using the proposed new curriculum, he could not give an outright answer. After a long pause he said it will depend on the level of knowledge of the person, I asked what exactly he meant by that and he said how smart the person is and I asked how he will determine that and he said he will just know.

Again, when he was asked if the curriculum was reviewed as suggested and the new curriculum is used in educating radiographers and they are to interpret radiographs, what will he propose to be the scope of practice in image interpretation? He said that is where he had a problem because he did not think it will be useful to limit radiographers who interpret images. He argued that if radiographers were to interpret images then they should interpret everything. He said it will be useless if they are limited in scope and the public will not benefit from it. When asked if specialisation denied patients of the services

provided by the specialist, he said that was different. Pressed to expatiate on his answer on how different that was, he said it was not the same and that it was different.

His attention was drawn to the fact that in the UK where advanced practice had been largely accepted, radiographer reporting is within a scope and also that even radiologists are specialising into particular areas so it will not be wrong to have radiographers specialising in a particular area, he said it is because radiographers can't interpret radiographs in all areas that is why they have been restricted to particular areas and not because of any specialisation. He does not see why there should be any limiting scope. He also contended that it will be practically impossible to enforce if reporting radiographers are limited by scope.

This he says was because the patients will not know which areas the radiographers are allowed to report and as such might send radiographs of examinations in areas the radiographers are not allowed to report on, and the radiographers might not tell the patient of their limited scope.

On the question of if all the radiographs in his facility are interpreted since it is a relatively smaller hospital, he said no. When asked why, he said there was no policy in the hospital requiring that all radiographs should be reported on and that some medical officers argue that the additional fee that patients pay to have their radiographs interpreted is cost that patients can't bear. He argued that nationally, there is no policy on image reporting and

as such each hospital does what it deems fit to do. Asked if there is any policy within the hospital for timelines within which radiographs should be reported he said no.

It became obvious that not only is there a need for a national policy on image reporting with timelines, but there is also the need to audit image interpretation by medical officers. That is the only way the real situation of image interpretation accuracy by medical officers can be determined.

Asked what he felt will be the solution to a shortage of radiologists further compounded by a much skewed distribution. He argued that by setting up teleradiology centres in all regional capitals so that the radiographs will be uploaded onto a common platform for the radiologists in the regional hospitals to report on them. His attention was drawn to the fact that his suggestion had many flaws because first of all not all the regional hospitals have radiologists, secondly most of the district hospitals still use analogue equipment's so their images can't be sent electronically to the teleradiology centre and lastly internet services are not reliable in the rural communities. He pointed that the Ghana Health Service should find a way of getting radiologists to at least all the regional hospitals.

In concluding the interview he was asked to give three suggestions that would improve the practice of radiology generally in the country. He listed continuous professional development for both radiographers and radiologists, the need for government to replace all analogues radiologic equipment in the country with digital equipment to enhance the quality of images produced and also improve the work environment of the radiographers

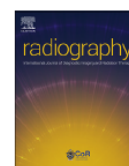
and finally to improve internet services to all rural hospitals to allow for a future of tele medicine.

PA2 came across as someone who was not in support of radiographers taking up reporting responsibilities and he in many ways said why it should not be allowed. He however also gave conditions that must be met for radiographers reporting images to be implemented but was quick to add that radiographers taking up image interpretation was not the solution to the problem of radiologists' shortage that has led to unreported radiographs in Ghana. The interview was interesting and the interactions were cordial apart from the fact that the process was interrupted a couple of times. He indicated his availability to clarify any issues in the course of the research and also that he will want to see a copy of the transcript of the interview.



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Review article

## Opportunities for radiographer reporting in Ghana and the potential for improved patient care

A.-R. Wuni\*, N. Courtier, D. Kelly

Cardiff University, School of Healthcare Sciences, 13th Floor, Eastgate House, 35-43 Newport Rd, Cardiff, CF24 0AB, United Kingdom

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### ABSTRACT

**Objective:** To explore factors that influence the introduction of role extension in radiography and to discuss its potential for improved healthcare in Ghana.

**Key findings:** Key findings of this review are the lack of literature on role extension in radiography in Ghana. The factors that have influenced the introduction of role extension in radiography globally include a shortage of radiologists, increased demand for radiology services, government policy and radiographer's desire for professional development.

**Conclusions:** Evidence indicates that radiographers can report radiographs as accurately as radiologists and appropriate education improves their performance. Radiographer-led reporting is the professional practise most likely to deliver local patient benefit. Developments in professional perceptions, training, education and regulation of reporting are required to establish confidence in radiography-led reporting.

**Implications for practice:** Radiographer reporting has the potential to improve patient outcomes, reduce waiting times, increase job satisfaction for radiographers and result in financial savings.

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### Introduction

Extended working is the post-qualification acquisition of skills or activities that extend healthcare practices by working across professional boundaries.<sup>1,2</sup> The terms role extension and advanced practise are sometimes used interchangeably, but it is instructive to consider them as describing distinct roles: the former being to perform a task, such as image reporting, to a skilled level<sup>3</sup>; the latter signifying a broader set of professional activities, likely to influence wider care pathways.<sup>4</sup>

There are examples of extended roles in nursing and some allied health professions from the US, Canada, UK, and Australia, all of which have advanced nurse practitioner roles and, for example, the assistant radiologist role in the US. Established drivers for extended roles in radiography are an increased imaging workload and shortage of radiologists, coupled with advances in health system technologies and professional aspirations of radiographers.<sup>6-8</sup> Sustained implementation of extended radiography roles in the UK<sup>9</sup> and other developed countries<sup>10-14</sup> has demonstrated latent benefits to healthcare in terms of reduced patient waiting times, reduced healthcare costs, enhanced job satisfaction for practitioners and increased accuracy of reports.<sup>4,7,15-26</sup> Despite such

benefits, professional divisions endure between radiography and radiology regarding the appropriate scope of practices.<sup>15-17,27</sup>

Developing countries share the generic workload drivers for role extension, but face additional resources constraints<sup>28</sup> and a particular historical development of professional power hierarchies or political/social systems that favour the status quo.<sup>29</sup> This paper evaluates role extension opportunities for diagnostic radiography in Ghana with a focus on image reporting: contexts to this discussion paper being stark deficiencies in radiologist coverage, a substantive backlog of unreported radiographs and the potential for a positive impact from radiographer reporting on societal health in Ghana. Evidence, primarily from the UK, is used to inform a model of radiographer reporting in low resource settings. The UK experience is relevant as Ghana inherited many NHS structures and practices through colonial legacy.

#### The Ghanaian health system

The Ministry of Health (MoH) formulates policy and provide strategic direction for national healthcare delivery. MoH policies are implemented by the Ghana Health Service (GHS), which is responsible for all health facilities except private, teaching and mission hospitals.<sup>30</sup> The not-for-profit faith-based hospitals, and the few private hospitals, accept the MoH National Health Insurance Scheme. The hierarchy of GHS provision is from national headquarters to

\* Corresponding author.

E-mail address: [Abdul-RazakW@cardiff.ac.uk](mailto:Abdul-RazakW@cardiff.ac.uk) (A.-R. Wuni).

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regional health directorates/hospitals, district health directorates/hospitals and finally to local polyclinics.<sup>30</sup> Nine of the 10 regional hospitals are equipped with modern digital X-ray machines and a CT scanner. Each of Ghana's 216 district hospitals has a radiology unit including (at least) a general-purpose x-ray unit and ultrasound machine. However, a shortage of radiologists and lack of contingency planning has meant that the MoH has had to train radiographers and midwives in the district hospitals in obstetric ultrasound. This training was implemented in an ad hoc way without a strategic policy.

#### Radiologist provision

Ghana has a population of about 25 million.<sup>31</sup> However, in 2014, there were only 35 radiologists in the country.<sup>31,32</sup> Select workforce comparators are provided in Table 1. Despite the number of UK radiologists being considered inadequate<sup>33</sup> it is approximately 70 times the number of radiologists-per-head of Ghanaian population.

The national shortage of radiologists is exacerbated by their uneven distribution across the administrative regions of Ghana (Fig. 1).<sup>32</sup> For example, the Northern region accounts for 30% of the total land mass and 10% of the national population,<sup>38</sup> but currently has only two visiting radiologists.<sup>32</sup> Most radiologists are located in the southern capital Accra and in the second city of Kumasi. The skewed distribution of radiologists is compounded for service users by the fact that those regions ill-served by radiologists also have the fewest doctors. For example, the doctor-to-population ratio in greater Accra region in 2015 was 1:7,196, whilst the figure for Upper East region was 1: 30,601.<sup>39</sup>

A net effect of gaps and inequalities in access to radiology services are many unreported radiographs and overburdened doctors with inadequate training to interpret images. Figures are not currently available, but in the (lead) author's wide clinical experience in Ghana, a majority of all radiographs remain unreported with high rates in regions with low doctor-to-patient ratios. The MoH does not currently have a strategy to address the radiologist shortage. The cost to the GHS of employing a senior radiographer is approximately £4000 per annum compared to at least £8500 for a radiologist.<sup>40</sup> The number of unreported radiographs combined with health economic considerations suggest that Ghana is ripe for an evaluation of radiographer reporting, including the extent to which the political will and other required conditions exist.

#### Radiography in Ghana

The first radiology unit was established in the Korle Bu teaching hospital in 1929 by the colonial Governor responsible for the Gold Coast.<sup>41</sup> This was principally in response to a nationwide outbreak of tuberculosis amongst workers in the lucrative mining industry.<sup>41</sup> The service then relied upon nurses with a few weeks training to operate radiographic equipment. Now radiography is a degree-level profession with a developing Society of Radiographers (GSR) and a new regulatory body of allied health professions (AHPC).<sup>41</sup> Key educational milestones include: the MoH establishing a

school of radiography in 1951; adoption of a modified UK diploma curriculum whilst a UK trained radiographer (Mrs Harriet Dua) was principal; the conversion to University of Ghana status with a bachelor's degree award in 2002 and postgraduate programmes from 2006.<sup>41</sup> In the context of proposing changes to professional boundaries, it is notable that the introduction of a degree programme in Ghana did not meet the same resistance that was seen from the UK DoH and professional stakeholders.<sup>41,42</sup> This was largely due to justification provided by the previous UK experience.

There are currently 300 registered radiographers practicing in Ghana<sup>43</sup> compared to more than 26,000 radiographers registered with the HCPC in the UK (Table 1).<sup>44</sup> In a historical parallel to 1929, the MoH has recently commissioned 52 modern digital x-ray units for installation at district hospitals as part of the national tuberculosis control program.<sup>45</sup> Resource constraints require locally appropriate and innovative approaches to role extension in radiography to match the investment in equipment. We propose a phased approach to role extension by advocating for the initial adoption of radiographer reporting, where the potential impact on access to healthcare is likely to be greatest.

#### Methods

This discussion paper explores opportunities for radiographer reporting in Ghana and its potential for improved patient care. Relevant literature was identified using a structured search approach. Google Scholar was used to establish current contextual data about the healthcare sector in Ghana and to conduct a scoping search of international literature on role extension in radiography. A comprehensive search of relevant literature was then conducted via Cumulative Index for Nursing and Allied Health Literature (CINAHL) and Medline via Ovid databases and the Radiography journal, as a key professional forum. Keywords used in combination were radiography, radiographer (and international variants radiologic technologist, x-ray technician, medical radiation technologist, radiologist assistant); role extension (and related terms extended scope of practise, role development, advanced practise, skill mix, non-medical consultants, radiographer reporting and red dot). The search was not limited by date so as to include key historical papers. No geographical limit was applied to include literature from developing countries, however, papers not written in English were excluded. Inclusion criteria were articles that focused on/including the radiographer reporting aspect of role extension with unrestricted accessibility to the full text. Relevant health policy papers were also sought from UK and Ghanaian governments.

Most of the located literature originated from the UK. No empirical papers or opinion pieces were found on role extension in radiography from Ghana. The only African literature was from South Africa and Nigeria. Although a much larger country, Nigeria provides a close geographic, social and economic parallel to Ghana. South Africa is more developed but has commonalities in that both

**Table 1**  
Comparison of radiologist/radiographer to population ratio in Africa and Europe.<sup>31–37</sup>

Country	Population (million)	Number of radiologists/100,000 population	Number radiographers/100,000 population
Ghana	25	0.14	1.2
Kenya	43	0.47	2.4
UK	60	7	43.3
Greece	11	30	Not available
EU average	19	12	43.9

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Figure 1. Estimated number and distribution of radiologists throughout the administrative regions in Ghana in 2019.

have a severe shortage of radiologists and radiographers are legally barred from producing reports.

Four common themes were identified from the retrieved articles: factors that influence the introduction of role extension; accuracy of radiographer reporting; education and training requirements; benefits of role extension/radiographer reporting. These themes are discussed against the Ghanaian context and the conditions required for local implementation of radiographer reporting considered.

## Discussion

### *Factors likely to influence successful implementation of role extension*

With many unreported radiographs and only 35 radiologists in 2014<sup>32</sup> the key generic requirements for the implementation of radiographer reporting in Ghana are present. A national survey to estimate the proportion of unreported radiographs would help

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define the problem for service planners. Projection radiographs account for 54.6% of all imaging studies in the UK.<sup>46</sup> It can be assumed that this proportion is significantly higher in Ghana given that there is national coverage of x-ray units, but just 12 MRI<sup>47</sup> and 35 CT scanners.<sup>43</sup> Two thirds of the scanners are located in the capital city Accra, with half the regions having no MRI facilities.<sup>43,47</sup> All regions that do have these modalities have resident radiologists who ensure that all scans are reported on, even at some delay. Consequently, population health benefit is most likely to be realised from concentrating initial role extension efforts on the reporting of projection radiographs.

International literature reveals that perceived or real radiographer shortages are a live concern when seeking how best to meet rising reporting demand: either through role substitution from existing staff groups, or by establishing new roles.<sup>6,48</sup> Current radiographer numbers in Ghana (300) are already inadequate to address existing projection radiograph demand.<sup>44</sup> Fortunately, the workforce is set to expand significantly as the number of universities offering a BSc radiography programme has increased from one to four.<sup>43</sup> However, there will be a delay before the benefit of increased capacity is realised, so we propose that implementing radiographer reporting in regions currently deficient in radiologists is likely to have the greatest impact on patient outcomes, whilst maintaining sufficient radiographers to supervise the new graduates. Radiologists' enthusiasm, and the effect of their pressure/enthusiasm on the radiographer's professional behaviours, is then crucial concerns in terms of the success of implementing radiographer reporting in Ghana.

There appears to have been some supportive radiologists in UK NHS trusts that championed role extension in UK radiography.<sup>6</sup> Despite successful collaboration between the UK College of Radiographers and the Royal College of Radiologists (RCR), the latter has indicated that it still does not believe non-medical reporting of radiographs is a solution to the radiology crisis in Scotland.<sup>6,27</sup> The GSR generally has an excellent working relationship with the Ghana Association of Radiologists (GAR), but the local precedent of strong resistance from radiologists towards radiographers performing ultrasound scans suggests the GSR should anticipate similar challenges. This resistance to radiographers performing ultrasound scans was seen to be expressed during stakeholder consultations. The GSR's task will ultimately have to present government with evidence that will convince them to amend the law, which currently bars radiographers from providing written reports.

Part of the resistance to radiographer reporting expressed in the literature,<sup>6,7,15,16,27</sup> is that, as a profession, radiology has argued role extension would limit training opportunities for junior radiologists.<sup>6</sup> In Ghana, experienced radiographers may be considered to be an appropriate resource for the teaching of junior radiologists, as already happens informally in the absence of senior radiologists.

Similar to the transition to a radiography BSc degree in Ghana, the fact that the UK has demonstrated a viable model for radiographer reporting provides the GSR with powerful evidence for this initiative. A fundamental strand of evidence to this case is that vast areas of Ghana still have no radiologists. Nigeria has a similar problem with 44.5% of hospitals surveyed in Nigeria having no radiologists, only 33% had resident radiologists and 22.5% relied on visiting radiologists.<sup>49</sup> The closest evidence available, in terms of geography, regarding radiologists' attitudes comes from a 2009 survey of South African radiologists in the Western Cape area, which reported that 68% supported role extension for radiographers. Furthermore, many were willing to act supportively, for example assessing clinical competence as well as acting as clinical mentors or supervisors as well as offering academic support.<sup>50</sup> These data give some further indication of the level of professional support/resistance that may be expected from radiologists in Ghana.

### Accuracy of reporting

There is a significant body of published evidence for the GSR to draw that supports the proposition that suitably trained radiographers can perform reporting to the same standards as radiologists in most areas of imaging.<sup>18,51–58</sup> International data demonstrates that radiographers, following an accredited postgraduate programme delivered in a robust academic environment, are capable of identifying abnormal chest radiographs and provide a report on abnormal appearances to mean sensitivity and specificity scores of 95.4% (95% CI 94.4–96.3) and 95.9% (95% CI, 94.9–96.7), respectively.<sup>56</sup> Radiographers can report on a broad range of chest pathologies under controlled conditions and show high concordance with consultant radiologists.<sup>56</sup> Nigerian radiographers have been shown to be able to interpret chest x-rays with mean sensitivity and specificity of 76.9% (95% CI, 65.8–86.4) and 79.8% (95% CI, 65.8–86.4), respectively.<sup>56</sup> The negative disparity in sensitivity and specificity between this study and UK data<sup>48</sup> could be partly because the participants in this study had not undergone formal training in radiograph reporting. Furthermore, the level of accuracy was positively associated with the number of years in practise<sup>56</sup> suggesting the segment of the radiographer workforce to be targeted initially. Evidence of the ability of radiographers to report musculoskeletal (MSK)<sup>18,51–53</sup> CT and MRI across anatomical sites also supports the potential for further role extension.<sup>57–59</sup>

### Future radiography education requirements

Extended working requires education that is commensurate to meet the changing needs of local practise.<sup>60</sup> Extensive personal experience of rural and municipal radiography in Ghana by the first author of the current paper provides anecdotal evidence that some radiographers, particularly in rural areas, are already interpreting radiographs on an informal basis, and thus working beyond their official scope of practise. This situation needs to be formalised to ensure compliance with legal frameworks, prioritise patient safety and protect individual practitioners. This would require an undertaking from internal and external partners that radiographer reporting is underpinned by postgraduate level education. This transition may be made more straightforward as Ghana prides itself on using educational curricula similar to those used in the UK.

Some of the requisite clinical knowledge and teaching skills to enable postgraduate programs in the clinical areas required by Ghana, such as radiographer reporting, may best be provided from high knowledge settings in other countries/regions (either online or face-to-face).<sup>61</sup> Radiologists need to be involved, ideally in the development of programmes, lecturing, examining and also, crucially, as mentors to radiographers. Clinical mentorship is likely to be critical to the task of building reporting capacity in the face of staff shortages.<sup>62</sup> Another early priority for HEIs will be to review the undergraduate curriculum to ensure that image interpretation and clinical reporting are included at the foundation level.<sup>63</sup> For example, to start by preparing junior practitioners to provide preliminary comments on MSK radiographs as a foundation for transition to full reporting.<sup>8</sup>

Whatever the exact mix of learning provision, advocacy for radiographer reporting is only likely to be realised if it is spear-headed by the GSR in concert with HEIs.<sup>64</sup> A key structural development in progressing the education agenda is that the GSR (in association with other allied health professions) are advocating for the establishment of a Ghana College of Allied Health Professions. Crucially, a joint legislative instrument has been drafted by the professional bodies with the support of the MoH to ensure that this college becomes a reality.<sup>55</sup> Once established, this college would be

responsible for postgraduate education and specialisation, with the overarching mission to improve patient care.

#### *Potential to improve access to quality healthcare*

International evidence demonstrates that radiographer role extension can contribute to improved access to healthcare via reduced workload of radiologists, consequential shorter waiting times for patients, and improved rates of reporting and accuracy of reports, as well as increased job satisfaction for radiographers and health service cost reduction.<sup>4,15–26</sup>

It is vital for the profession that the case for cost saving is not at the expense of patient outcomes. International evidence suggests that morbidity has not increased with the introduction of radiographer reporting of trauma MSK radiographs, although in some instances there has been a reduction in the number of false negative diagnosis and subsequent patient recalls.<sup>54</sup> It can therefore be assumed that the strategic introduction of radiographer reporting in Ghana could increase the proportion of reported radiographs and hence improve clinical diagnosis and timely treatment interventions that have the potential to reduce patient morbidity and mortality.

Evidence of cost reduction to hospitals through service redesign, role substitution and reduced pay differentials<sup>8</sup> is likely to be particularly important to policy makers in a developing country. Ghana has many competing demands for extremely limited resources and the case for radiographer reporting will be strengthened by drawing on such data-driven arguments in alignment with professional drivers. The patient benefit would be maximised if savings were redistributed within the GHS, for example to further improve patient access via having more staff and equipment. Radiographer-led reporting in the emergency department (ED) has already demonstrated cost effectiveness.<sup>65</sup> That such a chronic shortage of ED beds in Ghana results in some patients being turned away, potentially leading to avoidable deaths,<sup>66</sup> provides a compelling case for radiographer reporting in this setting in order to reduce the waiting time for reports and so promote early patient discharge.

#### *Looking to the future*

The Ghana MoH has already introduced a physician assistant program to help cater for areas with an acute shortage of doctors.<sup>67</sup> The GHS has also trained radiographers and midwives in district hospitals to conduct obstetric ultrasound examinations for pregnant women. These initiatives provide a clear exemplar to embolden the GSR lobby for radiographer reporting in wider settings.

The formation of an Allied Health Professions Council (AHPC) as an independent regulatory body can be a significant development in progressing the radiographer role extension agenda.<sup>41</sup> If basic level practise is not adequately regulated, then the challenges facing extended practise are clear in a context where demonstrating competence will be crucial to persuade radiologists to relinquish professional control on practices such as reporting. The AHPC needs resources to effectively perform its task of regulation. Unfortunately, the MoH has not, so far, seemed willing to provide these. If the AHPC digitised the registration process it is likely more professionals would comply. The current situation where all registrants have to travel to the capital Accra to register/renew their licences acts as a strong disincentive. Enforcement of registration would be promoted if the AHPC liaised with the Health Facilities Regulatory Authority (HeFRA), which licences all healthcare facilities in Ghana to ensure that their personnel are qualified to practise.

A functioning professional body (GSR), stronger regulatory body (AHPC) and new educational body (Ghana College of Allied Health Professions) could work with radiologists (GAR), the MoH and other influential stakeholders, including patient advocates, to develop a deliverable policy on radiographer reporting (as a prime exemplar of extended working.) To gain professional traction, the policy should be implemented via an agreed protocol that would encompass basic elements such as educational requirements, scope of practise, procedures for reporting, reporting structures and requirements for continuing professional development.<sup>67</sup>

With appropriate postgraduate education focussed on radiographer reporting, there is every reason to believe that Ghanaian radiographers would be able to perform to the same standards as their counterparts in the UK. A baseline study to determine the current level of competence in image interpretation under controlled conditions is now indicated, as well as identifying image reporting skill/knowledge deficiencies to inform further training. Piloting and evaluation of radiographer reporting initiatives, particularly in regions with low doctor-to-population ratios, could help establish feasibility and would provide early data on effectiveness. Such a staged, data-driven approach is more likely to persuade the MoH to support policy that enables the introduction of locally responsive role extension.

#### **Conclusions**

Global drivers for role extension in diagnostic radiography include a shortage of radiologists, increasing workload, technological advancements and shifting health policy. Although no literature or empirical evidence was found on role extension in Ghana, differences in professional structures and resources suggest that the wholesale adoption of existing models may not always succeed in the Ghanaian context. Radiographer projection radiograph reporting is the area of professional practise most aligned with local resources and most likely to improve access to quality healthcare. Developments in professional perceptions, education and regulation of reporting will all be required to establish confidence in stakeholders. Evidence of economic and patient benefits through contemporaneous research and audit should underpin strategic planning for further role extension opportunities in Ghana and contribute to the case for radiographer role extension in developing countries.

#### **Conflict of interest statement**

There are no conflict of interest to declare.

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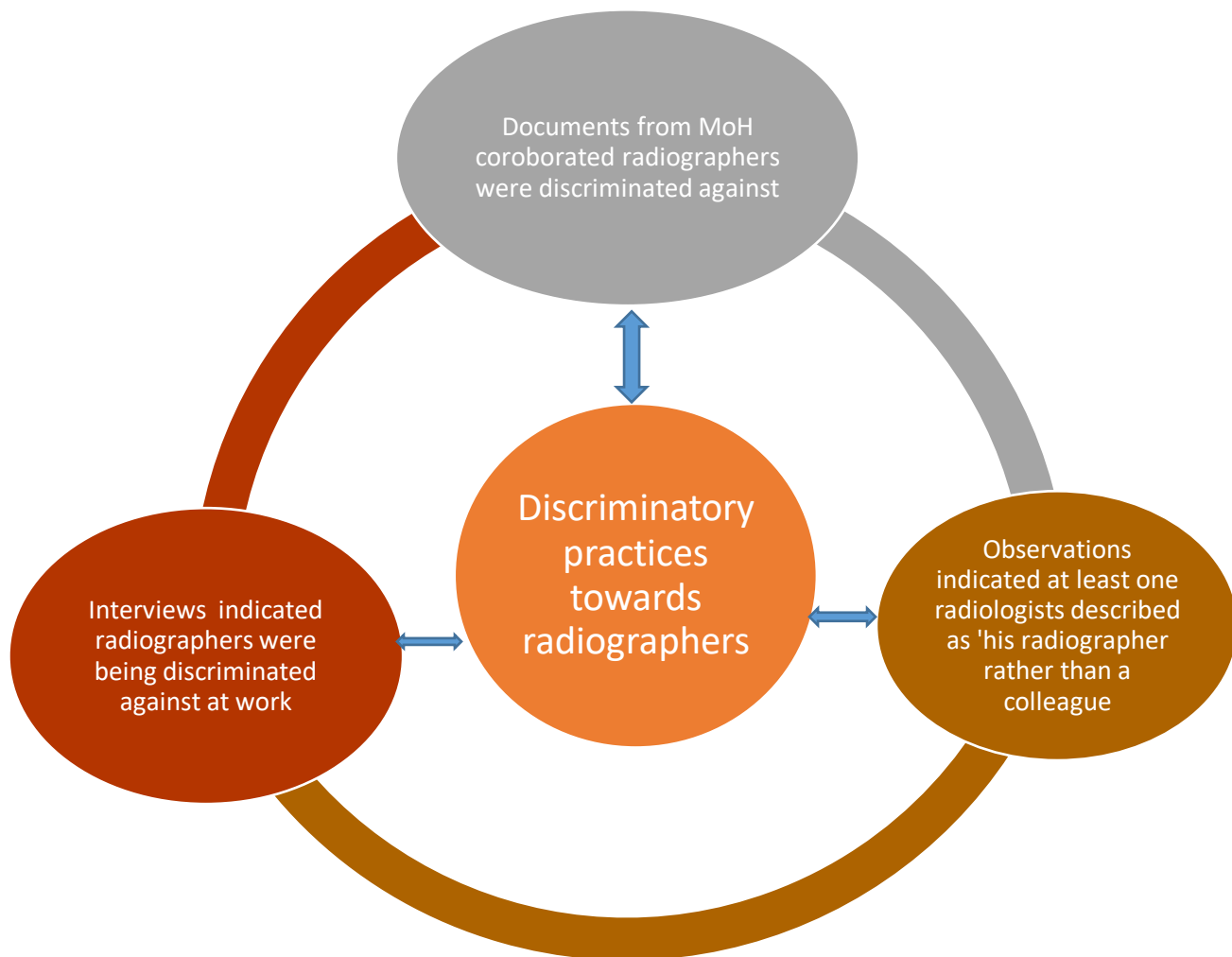
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Appendix M. A diagrammatic presentation of how triangulation of the data from various sources strengthened the case.



There was always cross referencing in the various data sources for corroboration or discord. In this example interviews indicated radiographers encountered discriminatory practices in their practices, this claim was cross referenced and documents from the MoH/ GHS corroborated the same and observation also showed how a radiologist did not relate with a radiographer within the same facility as a colleague but as 'his radiographer'.

Appendix N. Extract of how the theme on challenges to professional practice was generated from codes to sub-themes to the main theme.

Data item	Source of data	Code	Subtheme	Theme
In the ideal situation, consulting the technical people is the best but yes the situation that I have seen, you consult the technical person, put all the big nice English and documentation on paper but when the machine comes you realize that someone when to buy what they wanted to make money out of personally.	Interview with PT2 page 5	Procurement	Equipment procurement and maintenance	Challenges to professional practice
Many a time it also comes with the authorities or administrative problems where people will quote a figure and purchase something else because of kickback, we all know about corruption and things like that, but the major thing is funding and monitoring the type of equipment that are bought, that should have been at the ministry of health but I don't know how they govern it or the facility just buys it or if there is anybody inspecting it or	Interview with PT2 page 6	Corruption	Equipment procurement and maintenance	Challenges to professional practice

<p>giving clearance to the machine in the first place.</p>				
<p>I don't have anything to say about that one. Because the person who owns the thing, the government, says I want to purchase this, who can challenge the politician? Do you understand, if they say they want your input they will come for your input but if they say they don't want your input what can you do? But the best is to come for your input, normally they don't do that, I don't know probably somebody has an interest in somewhere but what else can you do. It is wrong, I am against it but that is the system we live in</p>	<p>Interview with PA8 page 7</p>	<p>Procurement</p>	<p>Equipment procurement and maintenance</p>	<p>Challenges to professional practice</p>
<p>It was observed that the participant was hesitant in talking about politicians and the role they play in acquisition of equipment; he appeared to be scared of possible victimisation. As is evident from his response, he initially said he had nothing to say about the role politicians play in the purchase of equipment. He appeared to be</p>	<p><b>Reflections of researcher.</b></p>	<p>Procurement</p>	<p>Equipment procurement and maintenance</p>	<p>Challenges to professional practice</p>



holding back to much more information				
You think about the availability of experts like engineers within that setting, so if maybe for example I am going it for a Philips equipment, I will sit back and say do we have any experience with Philips, are we aware of their level of expertise, do they have accessories and backups, so these are some the things we do, so if you don't seek to analyse these things and you go and buy or somebody imposes an equipment on you, who has very little experience of the items enumerated, then you are bound to face problems.	Interviews with PA3 page 2	Procurement decisions	Equipment procurement and maintenance	Challenges to professional practice
There are a lot of them like that, Kumasi is like that, Cape Coast is like that, and Tamale too is like that. Those ones they have a peculiar problem. Now the question is, the MRI for instance we have types, do you use the permanent magnets or the superconductors? Somebody once made a challenge that in developing countries, we should all get permanent magnets,	Interview with PA8 page 8	Procurement	Equipment procurement and maintenance	Challenges to professional practice

nothing like Helium or something, so that the machine will be working round the clock.				
Ministry of Health, Ghana Health Service and the Dutch Government through ORIO have installed X-ray machines in forty-eight hospitals across the country. Unfortunately, most of these X-ray machines are not used because there are no radiographers to operate them. These unused X-ray machines are in addition to some X-ray machines which were installed earlier under different projects	Document from MoH	Shortage of radiographers	Equipment procurement and maintenance	Challenges to professional practice
The politics in equipment purchases is just unbelievable. Most of the time our input is not sought but in a few instances we are invited to make inputs and we will spend time and energy to make our input only for us to realise that it was not used when the equipment's arrive for installation. It almost seems like that is the money bag for the politicians	Interview with PA 10 page 2	Procurement	Equipment procurement and maintenance	Challenges to professional practice
There are radiographers who have refused to work for the government sector because they	Reflections of researcher	Radiographer shortage	Staff shortage, workload and discriminatory practices	Challenges to professional practice

<p>argue the private sector offers them better salaries and conditions of service. It is therefore possible that the shortage of radiographers in the government hospitals does not really mean there is a short supply of radiographers but because they are electing to work in private facilities.</p>				
<p>It was observed the Ghana Health Service offers motivation and incentive packages to get medical officers to accept posting to deprived or rural areas in the country but the same is not done for other healthcare professionals.</p>	<p>Reflections of researcher</p>	<p>Discriminatory practices</p>	<p>Staff shortage, workload and discriminatory practices</p>	<p>Challenges to professional practice</p>
<p>The challenge of the public sector is that or the problems that they raise is that the service agreement is so expensive that even the work that they do is not even to pay for the service contract, so most of them either they don't have the service running or their service has expires. So when there is a problem, then the machine is going to do down for a long time.</p>	<p>Interview with PA8 page 7</p>	<p>Equipment Maintenance</p>	<p>Equipment procurement and maintenance</p>	<p>Challenges to professional practice</p>
<p>Each region should group the hospitals with X-ray</p>	<p>Document from GHS</p>	<p>Shortage of radiographers</p>	<p>Staff shortage, workload and</p>	<p>Challenges to professional practice</p>

<p>equipment into zones</p> <p>Appoint a qualified licensed Radiographer for each zone to supervise and manage the operation of the X-ray equipment within their jurisdiction</p> <p>The appointed qualified licensed Radiographers shall act as Radiation Safety officers for the hospitals assigned to them.</p> <p>The hospitals with X-ray equipment but have no licensed Radiographers shall engage unlicensed Radiographers on temporary appointment</p>			<p>discriminator y practices</p>	
<p>Most of the equipment that are installed have technical limitations because of the installation considerations. For instance, this one here,</p>	<p>Interview with PW1 page 3</p>	<p>Equipment installation</p>	<p>Equipment procurement and maintenance</p>	<p>Challenges to professional practice</p>

the chest distance is restricted by the Bucky table				
We had only one machine which was breaking down frequently because of the pressure so turn to send patients to Nadowli to take x-ray and come back. Sometimes patients who have fractures but will have to move all the way to (place named) up and down and come back for a decision to be taken on what to do	Interview with PW3 page 2	Equipment breakdown	Equipment procurement and maintenance	Challenges to professional practice
Apart from decent accommodation furnished with soft furniture and satellite TV, we would want the Medical Officers to be supported with fuel and per diem to attend the following activities every month.  Continuous Professional Development (CPD)	Document from GHS	Discriminatory practices	Shortage of staff, workload and discriminatory practices	Challenges to professional practice

<p>Public Health workshops</p> <p>Monthly meetings with Regional Director of Health Service (RDHS)</p> <p>Ghana Medical Association (GMA) Meetings</p> <p>Other activities in the Region or Hospital.</p> <p>And occasional transport support to see family if they are not together.</p> <p>In addition to the above, each Medical Officer will be sponsored for further studies when he/she decides to go for specialisation.</p>				
<p>Patients don't get their reports early, means that doctors just have to continue with whatever treatment plan and sometimes some of the patients even pass on before the reports are ready. So</p>	<p>Interview PT3 Page 3</p>	<p>Delayed reports</p>	<p>Staff shortages workload and discriminatory practices</p>	<p>Challenges to professional practice</p>

<p>probably the early intervention by issuing the report could have possibly saved a life, but because of delay some of these things occur. There are a lot of reports laying in the department, patients never return to pick them up because of some of these things.</p>				
<p>We are also challenged in specialization, as a radiographer you are supposed to be an all-rounder, from basic general radiography, to fluoroscopy, CT scan and MRI. We don't have the comfort of specializing in maybe just CT, I am just a CT radiographer or an MRI radiographer, you should be an all-rounder, it is a challenge. So, we don't have the leeway to specialise and have in-depth knowledge in a particular modality, maybe it is coming from sponsorship for further programs in this specialisation or maybe unavailability of the modalities.</p>	<p>Interview PA3 Page 3</p>	<p>Lack of specialisation</p>	<p>Staff shortages workload discriminatory practices</p>	<p>Challenges to professional practice</p>
<p>Radiographs should normally be accompanied with a</p>	<p>Observation</p>	<p>Radiologists shortage</p>	<p>Staff shortage, workload and</p>	<p>Challenges to</p>

<p>report interpreting the findings on the radiograph; this is often not the case in the sites this study covered. Mainly because one of the sites neither had a resident nor visiting radiologist, one had a single radiologist and the third site, even though had majority of the radiologists in Ghana, they were still overwhelmed with the amount of work. This situation had therefore led to most radiographs not reported; the few that are reported are not reported on time and takes from a couple of days to weeks to be ready</p>			<p>discriminator y practices</p>	<p>professiona l practice</p>
<p>Shortage of supplies like the x-ray films, sometimes envelopes to even put the films in for patients is a problem and the usual consumables like gloves, methylated spirit, cotton wool and the rest to make the work flow smoothly. When they are not available it kind of impedes the flow of work</p>	<p>Interview with PT3 page 2</p>	<p>Shortage of basic supplies</p>	<p>Shortage of consumables, lack of basic facilities and services</p>	<p>Challenges to professional practice</p>
<p>During an observation in a rural hospital, the hospital had run out of X-ray films. The images</p>	<p>Observation</p>	<p>Shortage of consumables</p>	<p>Shortage of consumables, lack of basic</p>	<p>Challenges to professional practice</p>



<p>had to be put on a tablet and sent to the requesting physician to examine and then it is brought back for the radiograph of the next patient to be loaded and the whole process repeated. There were no facilities provided for the requesting physician to have access to the radiographs in either their consulting rooms or the wards. The requesting physician in some instances had to view the radiographs on the computer monitor in the radiology department.</p>			<p>facilities and services</p>	
<p>I have a patient with an ectopic pregnancy, I want to do a speculum examination, to see if I could do a culdocentesis, they tell me we don't have a gynaecological set for that examination, it is also when the gynaecologist comes that he brings his own set. When that happens, you are unable to help, that diagnosis alone if you are able to make and picking it up early, you can refer this case of ectopic for urgent surgery so that you</p>	<p>Interview with PA7 page 2</p>	<p>Lack of basic facilities</p>	<p>Shortage of consumables, lack of basic facilities and services</p>	<p>Challenges to professional practice</p>

don't lose the patient, but this delay affects patient care in the long run				
Even radiation monitoring, we are not being monitored, Ghana Atomic Energy Commission (GAEC) for the past 4 months they say their machines have broken down. So, no Ghanaian radiographer is being monitored for now, it is a demotivation, no radiation worker should work without being monitored, GAEC and Radiation Protection Institute (RPI), they have the sole responsibility to monitor us, their equipment is broken down for the past 4 months, they are trying to acquire one	Interview with PA3 page 9	Radiation monitoring	Shortage of consumables, lack of basic facilities and services	Challenges to professional practice
Please to inform you that our personal monitoring services have been temporarily suspended due to a technical challenge with our TLD reader system, which is rapidly being resolved	Document from RPI	Radiation monitoring	Shortage of consumables, basic facilities and services	Challenges to professional practice
We acknowledge receipt of your letter	Document from NRA	Radiation monitoring	Shortage of consumables, basic facilities and services	Challenges to professional practice

<p>(reference letter) requesting the Nuclear Regulatory Authority (NRA) to furnish you with the list of institutions accredited by the NRA to provide dosimetry services in Ghana. Kindly find below the requested list and the type of device they provide.</p>				
<p>I mean we are radiation workers we need to be monitored. TLDs are being given to you and you wear it over three months and over a year and nobody comes for it to send to the appropriate body to be read and even if they are read, results are not given to you to know the dose that you have received within a particular period. Usually the results are left at the management level and it is difficult tracing to find out some of these results as an individual.</p>	<p>Interview with PT4 page 2</p>	<p>Radiation monitoring</p>	<p>Shortage of consumables, lack of basic facilities and services</p>	<p>Challenges to professional practice</p>

<p>It is also surprising that the council does not seem to be keen on using technology to make the registration and renewal easier for the professionals they regulate. It is interesting that even though it is cheaper to digitize registration and renewal of licenses than it is to operate regional and zonal offices, the council is more interested in the later.</p>	<p>Researchers reflections</p>	<p>regulation</p>	<p>Regulatory challenges</p>	<p>Challenges to professional practice</p>
<p>'Please I wish to bring to your attention the activities of some Medical Superintendents and Directors who are engaging unqualified people and in some instances, casual labourers to work in the laboratories in the absence of the striking Medical Laboratory Scientists. Particular mention can be made of (name of place) Government Hospital in the Brong Ahafo Region. These actions are both legally and ethically wrong and should be condemned and halted'</p>	<p>Document from AHPC</p>	<p>Disregard for regulation</p>	<p>Regulatory challenges</p>	<p>Challenges to professional practice</p>
<p>It is significant to mention that the council will not hesitate to invoke the relevant provisions in Part One, Act 857 of 2013 to halt</p>	<p>Document from AHPC</p>	<p>Stamping authority</p>	<p>Regulatory challenges</p>	<p>Challenges to professional practice</p>

such an illegality to protect the public				
Allied health professionals were left unregulated for several decades, so emmm the challenges now is because the professions were left unregulated for several years, now that the regulative framework is in place the awareness level is low and compliance is also low so what we are doing now is to try and create awareness and also enforce some of the provisions of the ACT.	Interview with PA9 page 1	Unregulated practice	Regulatory challenges	Challenges to professional practice
As a new agency under the ministry of health one of the challenges that we face is logistics and resources to be able to undertake the huge mandate that the council is entrusted with. Currently the council is regulating 18 different professions, so unlike pharmacy council or nurses and midwifery councils that are regulating mono-professions the AHPC is regulating 18 different professions so there is a huge responsibility in the way of the council.	Interview with PA9 page 1	Resource challenges	Regulatory challenges	Challenges to professional practice

<p>AHPC like I said regulates several professions who are spread across the length and breadth of the country, one of the things that we are trying to do with support from the ministry is to have zonal offices so we can bring our activities closer to the people across the length and breadth of the country. So that people from Tumu, people from Sefwi wiawso, people from sandema may not necessarily have to travel to Accra for some of the activities of the council.</p>	<p>Interview with PA9 page 2</p>	<p>Ease of registration</p>	<p>Regulatory challenges</p>	<p>Challenges to professional practice</p>
<p>Procurement decisions of an entity shall be taken in a corporate manner and any internal unit concerned shall contribute to the decision making process</p>	<p>Public procurement ACT 663 2003 (Document).</p>	<p>Procurement</p>	<p>Equipment procurement and maintenance</p>	<p>Challenges to professional practice</p>