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Citation for final published version:

Wuni, Abdul-Razak, Courtier, Nicholas and Kelly, Daniel 2021. Developing a policy framework to support role extension in diagnostic radiography in Ghana. *Journal of Medical Imaging and Radiation Sciences* 52 , pp. 112-120. 10.1016/j.jmir.2020.09.013

Publishers page: <http://dx.doi.org/10.1016/j.jmir.2020.09.013>

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Developing a policy framework to support role extension in diagnostic radiography in Ghana

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ABSTRACT

Introduction

A global shortage of radiologists is affecting the timely provision of imaging reports and thus healthcare delivery. This situation has been the main driving factor behind successful role extension by radiographers into areas that traditionally were within the scope of radiologists including image interpretation and reporting. The shortage of radiologists is even worse in developing countries like Ghana. There is a need for policy to guide the introduction and implementation of role extension in Ghana.

Methods

A qualitative single case study with multiple sites across the country was used. A sample of 16 participants, including 8 radiographers, 3 radiologists, 3 medical officers, a senior official each from the Ministry of Health and the Allied Health Professions Council, were interviewed about role extension.

Results

The findings indicate the need for a guiding policy of role extension to be spear headed by the Ministry of Health to gain the needed credibility. The findings suggest the policy should be made to meet the local needs of the country. It also established the policy should regulate education and training and the scope of practice.

Conclusion

The study established the need for policy to guide the introduction and practice of role extension in diagnostic radiography in Ghana. The study also established the need for a broad consultation of all key stakeholders based on an internationally accepted consensus building model.

Developing a policy framework to support role extension in diagnostic radiography in Ghana

Introduction

Radiological management of patients relies on timely and accurate interpretation of diagnostic examinations. Delays caused by a lack or absence of radiologists can adversely affect optimal decision-making and clinical outcomes.¹ The global shortage of radiologists² has driven role extension of radiographers into image interpretation and reporting, with

radiographers educated to postgraduate level now issuing independent written reports to the same standard as radiologists.^{3,4} This deficiency of radiologists is even more severe in developing countries: for example, Ghana recorded having only 35 radiologists in 2015.^{5,6} Table 1 places in context the situation in Ghana compared with other countries.

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	67	6.26	38.7
Canada	37	7	30
EU average	19	12	43.9

Table 1 Comparison of radiologist/radiographer to population ratio in Ghana and other countries.⁷⁻¹⁴

The Case

Ghana is divided into 16 administrative regions, each of which has a regional health directorate in charge of healthcare. These regional directorates also report to the national headquarters of the Ghana Health Services which is responsible for implementing all health policy formulated by the Ministry of Health. The minimum education for radiographers has been at Bachelor level until recently when the Ministry of Health introduced a Diploma in Radiography. Radiologists in Ghana are educated either through the Ghana College of Physicians and Surgeons or the West African College of Physicians and Surgeons. The Allied Health Professions Council regulates the Education, training and practice of all allied health professions including radiographers whilst the Medical and Dental Council regulates the practice of all medical officers, including radiologists. All the regional directors of the Ghana Health Services (GHS) are medical doctors, most directors at the national headquarters of the GHS are also medical officers and currently there is no director of allied health services at either the regional or national level. Allied health related issues are therefore handled by the director of medical services who is a medical doctor and there is a perception that they may not share the same ambition as radiographers seeing to advance their roles. Additionally, the Ghana Medical Association, which is the professional body for all medical doctors in Ghana, has a collective bargaining certificate and therefore recognised as trade union. However, the allied health professions do not have a bargaining certificate and therefore cannot bargain for conditions of service for members. The Health Service Workers Union bargains currently on behalf of all allied health professional groups. The HSWU is drawn from all persons working in the hospital who are not medical doctors, nurses or

pharmacists. This situation presents many challenges and important in terms of the context for the current study into the policy background for role extension in radiography.

The UK pioneered role extension in radiography practice,¹⁵ as a response to a rising demand for radiological services and government policy seeking to improve the patient pathway and reduce waiting times.^{16,17} It is important that other countries view this experience as a possible model rather than a template and identify local needs and tailor their role extension practices to meet these.¹⁸ However, evidence from other jurisdictions can help inform the formulation of locally effective radiography role extension policy to guide that practice.¹⁸ For example, the Australia Institute of Radiography (AIR) set up the Advanced Practice Working Group to define an appropriate national model of advanced practice,¹⁹ which evolved into an interprofessional review and recognition of key contextual factors. More broadly, national policy to support role extension in imaging can draw upon international experience suggesting that specialised radiographers can increase the health service expertise available to patients and thus bring about better imaging outcomes, reduce waiting times and re-attendance, reduce interpretation errors, as well as financial savings for organisations or health systems.²⁰⁻²⁵ Image interpretation roles may also help increase retention rates of radiographers in the workforce via increased job satisfaction and professional standing.^{26, 27}

Developing appropriate guidelines, protocols and a governance framework that encompasses education, redefining the scope of practice for radiographers and a means for auditing practice are generic requirements to support role extension in radiography.^{18, 28} The scope of practice in the UK varied depending on local needs and included musculoskeletal, chest, abdomen, head Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) for knee and lumbar spine image interpretation²⁹⁻⁴². The scope of practice to be determined by policy in Ghana should be guided by specific local needs. Wuni et al⁴³ identified opportunities for role extension in radiographer reporting in Ghana, identified the need for the education, training and regulation as critical elements and Atta-Boateng found that Ghanaian radiographers were willing to extend their role into image interpretation.⁴⁴ The current study builds on this finding by exploring the role that policy plays in guiding the introduction of role extension in Ghana and identifying areas that such a policy should address.

Aims

The aim of the study is to explore role, scope, and potential elements of policy that would support the implementation of role extension in radiography in Ghana.

Methods

A single qualitative case study design was used with multiple sites across the country. Case study involves the in-depth study of a phenomena (the case).⁴⁵ The case in this study was

the healthcare system in Ghana. The aim of the study suggested the need for an in-depth exploration of role extension and how to identify elements of effective policy to guide its introduction and adoption in practice. Case study was thus deemed the best fit for the study. Ethical approval was gained from the Ghana Society of Radiographers (GSR) (February 2017) and Cardiff University School of Healthcare Sciences Ethics Committee (October 2017). The GSR facilitated access approvals to their members and study sites. This study was guided by the Consolidated Criteria for Reporting Qualitative Research (COREQ).⁴⁶ Interviews were selected as the primary method of data collection.

Participants

A purposive sampling method allowed the recruitment of 'key informants or subject matter experts' likely to contribute data relevant to the study aims. A set criterion of expertise and or role and location was determined and participants that met these were then selected purposefully. Participants were first contacted by email provided by their professional associations. The sample comprised eight radiographers, three medical officers, three radiologists, one senior official from the Ghana Allied Health Professions Council (AHPC) and a representative of the Ministry of Health (MoH).

The radiologists were selected from two major cities. Two radiographers worked in higher education and six were based in clinical practice across the country. The medical officers were recruited from Accident and Emergency units in Accra, Tamale and Wa and the representative from the MOH represented the whole country. Participants were selected based on their expertise in policy development and/or engagement in contemporary radiography issues, range of locations of practice, and willingness and availability to take part. Written consent was sought before the scheduled interview date. All data were stored securely, and anonymity of participants assured. All persons contacted agreed to take part in the study with no dropouts. Some participants knew the first author prior to the study, but all participants were informed that the first author is a male radiographer and that the research was towards his doctorate. Steps taken to prevent bias include strict bracketing of WA's role as a researcher and radiographer and continuous reflections throughout the research process. It was also ensured that the researchers remained open-minded and interested in the opinions of the participants and reporting these accurately.

Interviews

Semi-structured interviews were conducted in a conversational style with the use of an interview guide, which was piloted, and comprised of questions and prompts relevant to the aims of the study. Interviews were mostly conducted face-to-face at locations (in their place of work) chosen by the participants, so that they would feel comfortable and reduce their travel time, which can be prohibitive in Ghana. Field notes were taken during and after each interview, and all were audio recorded and transcribed verbatim by first author. The first author and each participant were the only ones present during interviews. Member checking was attempted by sending all transcripts and interpretations to participants for

accuracy and views, however none of the participants responded. On the average interviews lasted 45 minutes. There were no repeat interviews. Table 2 contains the questions used for the interviews

Main question	Prompts and probes
<i>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?</i>	<p>Will you consider role extension for radiographers as a way of solving this problem and why?</p> <p>In your opinion how can it be implemented?</p> <p>Thinking of role extension what scope of roles should be extended and what should be the minimum qualification?</p> <p>Who will be involved in training the radiographers for extended roles and how will it be regulated?</p> <p>How will radiographers who extent their roles be placed on the existing structure that has no such provisions?</p> <p>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?</p> <p>How can it be regulated and controlled?</p>

Table 2 Interview guide.

Documentary review

The study reviewed available documents that were relevant to the study to enhance rigour. Review of documents gave perspective into various aspects of role extension in Ghana. An example of a document reviewed is the draft legislative instrument for Act 857 (2013). This document gave further insight on the thinking of the policy makers particularly towards role extension.

Data analysis

Thematic data analysis followed Braun and Clarke's (2006) model.⁴⁷ Primary themes were identified using an inductive process of data analysis aided by the NVivo 11 software. The data were reduced to ensure that the emergent themes that represented the range of participant's opinions and addressed the aim of the study and to enhance credibility and rigour.⁴⁸ Major and minor themes were identified and were presented in the results. Data were coded by first author and reviewed and revised by both the other authors. The review was done at a meeting and the categories were revised based on discussions at the meeting.

Results

Sixteen interviews were conducted between October 2017 and February 2018. One interview was conducted by Skype because the participant was out of Ghana over the period of the study and he was the only representative of that category.

The need for appropriate policy to guide the implementation of role extension in diagnostic radiography, and the formulation process required to minimise the likelihood of implementation failure are explored thematically. Participants proposed the need for regulation of the extended practice role, identified who should act as regulator, and clarified the key aspects of extended practice that should be regulated.

The basics of regulatory policy

Most participants across all professions agreed that, as a new and unregulated professional activity in Ghana, the introduction of role extension in diagnostic radiography would require new and effective policy to guide its inception. They argued that underpinning policy should demarcate extended practice role and provide the framework through which they are conducted. A policy formulated by the Government, rather than by the professional body alone, in this case the Ghana Society of Radiographers (GSR), would provide greater legitimacy and overcome likely resistance from radiologists:

[That policy has to be spearheaded by the Ministry of Health Ghana health service. They 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 to assist in areas without doctors to give prescriptions, that programme was carried out by the GHS and MoH, so they have to come up with a programme like the radiologist's assistant so that at least all the district and regional hospitals can be covered...] (Interview PA8 Radiologist)

A representative of the AHPC argued that, many unqualified (lacking competence to be working in the required area) personnel are already practising in various allied health professions because of longstanding deficiencies in professional regulation. It would therefore be necessary to begin the process of regulation of extended radiographic practice from its inception. Statutory powers are already enshrined in Act 857 (passed by Parliament in 2013) that, among other things, established the Allied Health Professions Council (AHPC):

[Unlike other health professionals in the country, allied health professionals were left unregulated for several decades, the level of awareness and compliance with the law is low. We are now raising awareness whilst enforcing the law. We are also devising ways of eliminating the practice of unqualified persons practicing. It is therefore important to regulate role extension from the start...] (Interview PA9 AHPC Official).

Process of policy formulation

The process of policy formation was seen to be crucial in shaping the actual content and, ultimately, whether policy is successful (or not). Participants argued that the underpinning process would need to include a significant consultation exercise:

If they (stakeholders) are involved in the process, they are likely to understand and co-operate (Interview PWI Radiographer).

Radiographer participants felt that radiologists would inevitably be involved in the education of radiographers seeking to extend their roles and therefore would also need to be involved in the planning stage of policy formulation:

[We will need to consult them (radiologists) 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. It is important to involve them right from the consultation stage so they don't feel left out or threatened, they will have a sense of ownership, which is important. ...] (interview PA5 Radiographer).

One radiographer suggested that all professions need to be educated regarding the societal and professional benefits of role extension that were demonstrated after implementation. The need to emphasise the prospect of beneficial change for the patients, who should be central to healthcare innovation, is considered paramount both morally and professionally and is likely to exert a strong influence on stakeholders:

[I think there should be sensitization because as it stands it looks like there is friction between radiographers and radiologists, so that the radiologists for example do not feel that we are taking over their jobs. it is just that we want to develop ourselves and we also know that the workload is a lot for them...] (Interview PA 1 Radiographer).

Another radiographer argued that, even though dialogue with radiologists is important, radiographers would need to present compelling data in order to support their case for role extension within the Ghanaian context at the policy formulation stage. The current study serves as a key piece of research to that end:

[I see the possibility of winning them over in dialogue but it should go with some information, you are citing cases in the UK and USA but you don't have any research within your own country. We need some information or research backing then sit with them and dialogue. I think that will be the best...] (Interview PT4 Radiographer).

1

2 **Ingredients of effective policy**

3 Agreement on the need for regulation of extended practice was unanimous across all sites
4 and professionals in the study. Finer grain questions about who, why and what should be
5 regulated generated more divergent views.

6 *Who should regulate extended practice in Ghana?*

7 The most popular view expressed by radiographer participants across all sites was that the
8 AHPC should be responsible for regulating extended practice:

9 *We should have the AHPC regulating it because as a radiographer in Ghana*
10 *you are regulated by the council (Interview PA4 Radiographer).*

11 One radiographer argued that the GSR could establish a subsidiary College of Radiographers
12 (CoR) with an education, research and public benefit remit to regulate on its behalf. The
13 rationale being that this model has worked in other countries with advanced radiography
14 roles and could therefore be fit for purpose in Ghana:

15 *[I think the society of radiographers can regulate extended by establishing*
16 *the college under the society. Some places have the College of Pharmacists*
17 *and College of Nursing or so. We can have a college of radiographers which*
18 *will oversee the activities of this training and empowering people to go into*
19 *role extension. ...](Interview PA5 Radiographer).*

20

21 One medical officer surmised that the Medical and Dental Council (MDC) was better placed
22 in Ghana to regulate other health professionals who have extended their roles into areas
23 previously within the medical domain:

24 *[There is the Medical and Dental Council that works normally, and they have*
25 *kept an overview of the activities of the physicians' assistants, anaesthesia*
26 *and dental assistants and anaesthesiologists,. I think the Medical and*
27 *Dental Council can be equipped to do the regulation...] (Interview PT2*
28 *Medical officer).*

29

30 *What should be regulated?*

31 The areas of extended practice that participants believed should be regulated most closely
32 included education and training; remuneration and conditions of service; professional
33 certification and identification; clinical postings and scope and standards of practice.

1 i) Education and training

2 The wariness about resetting professional boundaries evident between the radiographers and
3 radiologists was crystallised in justifications for appropriate education and training
4 programmes. A typical response from one radiographer was that a legal foundation was
5 needed that would govern the education of radiographers prior to adopting any extended
6 role:

7 *We should fight for a legal backing which will give us the mandate to do that*
8 *training (Interview PT4 Radiographer).*

9
10 Usefully, the draft legislative instrument for Act 857 (2013), which is yet to gain parliamentary
11 approval, would provide for the basic education required by any radiographer to become a
12 reporting radiographer. The document reiterates the need to educate professionals to meet
13 international standards of practice to enable them to offer the intended services to patients.
14 That education and training are enshrined in the draft legislative instrument (extract below)
15 is a strong indication of the need for policies to regulate educational standards as suggested
16 by PT4 above:

17 *A postgraduate certificate (PgC) or postgraduate diploma (PgD) or MSc that has been*
18 *accredited internationally or locally by the National Accreditation Board, Allied Health*
19 *Professions Council and the College of Radiographers. Education provision at this level*
20 *is required to take cognizance of postgraduate outcomes as identified internationally*
21 *by the World Health Organization (Pages 71/2 paragraph 129).*

22
23 Another medical officer argued for the need to certify suitably qualified personnel who can
24 adopt extended roles (such as image reporting):

25
26 *We can register all the radiographers who are trained, they are given PIN*
27 *(personal identification numbers), and they are given particular stamps that*
28 *identifies them. So, each radiograph that is reported is signed and endorsed*
29 *by the said radiographer. So, you are able to identify who does it and who*
30 *does not. That way not anybody will be able to report anything (Interview*
31 *PA7 Medical officer).*

32
33 It was further argued that there may be a need for sanctions for contravening any agreed
34 system of regulation:

35 *There should be sanctions, for instance, there should be guidelines and*
36 *standard operating procedures, if you are found guilty of going contrary to*
37 *the guidelines or the standard operating procedures, the sanctions should*
38 *be applied . The sanctions can be in any form from demotion, suspension*

1 *and even withdrawal of license to practice depending on the severity of the*
2 *offence that you have committed (Interview PA8 Radiologist).*

3
4 ii) Remuneration and conditions of service for extended roles

5 Remuneration for practitioners who do extend their role was a concern for radiographer
6 participants. They argued that any policy that does not include rules on salary structures
7 would serve as a disincentive to role extension as they perceived no financial reward for
8 taking on greater professional responsibility:

9 *[I think there should be a separate grading system for specialist as pertains*
10 *with the other healthcare professionals in Ghana. As it stands now we have*
11 *radiographer, senior radiographer, principal radiographer, assistant chief*
12 *radiographer and chief radiographer and then when you get to chief that is*
13 *all...] (Interview PW2 Radiographer.)*

14
15 Radiographers that currently pursue postgraduate studies are financially better off working
16 in higher education than in clinical practice. Consequently, postgraduate or highly skilled
17 radiographers often leave the clinical department for academia. They may, however, be
18 needed to educate the next wave of extended practitioners as part of this policy approach.

19 One of the radiographer participants contended that the majority of radiologists in Ghana are
20 located in the two largest cities, leaving some regional hospitals and almost all district
21 hospitals without any radiologist. He therefore opined that deployment of radiographers who
22 have extended their roles should be regulated to favour such settings:

23 *[We can start by not putting the radiographers in a conflict situation, by*
24 *posting them to places where there are no radiologists like the district*
25 *hospitals or the smaller clinics where the radiologists will typically not want*
26 *to go. Once we post them there, they would not have issues because their*
27 *target will be the main cities...] (Interview PA5 Radiographer).*

28
29 **Regulating the scope and standards of practice**

30 Two contrasting arguments were made about scope of extended practice. Most participants
31 across professions and sites were in favour of limiting practice to a single speciality:

32 *I think it should be based on speciality so that we will have radiographers*
33 *who are only into say chest reporting, others the appendicular or axial and*
34 *maybe others on skull. Some may also go into head CT reporting and we*
35 *make progress from there. (Interview PW2 Radiographer).*

1 However, this approach could also be less flexible to meet local need:

2 *I do not think there should be limitations, if there should be limitations does*
3 *it mean the person is specialising in some aspect? How do you know that*
4 *this aspect is better for the person or not? If you are doing it then you have*
5 *to do it fully or you want to do it such that this person is for only Musculo*
6 *skeletal, no, in that situation it may not help the communities where they*
7 *are working (Interview PA2 Radiologist).*

8
9 One radiographer argued the self-evident but important point that standards of practice need
10 to be maintained (or improved) regardless of which healthcare professional provides the
11 service, and thus it was important to ensure that the radiographers who did extend their roles
12 had the required competencies to do so:

13 *It should be known that this group of people have this competence and so*
14 *can offer this service (Interview PA4 Radiographer).*

15 Similarly, it was argued that supervision and continuous monitoring and evaluation of the
16 quality of services provided by extended practitioners would help in ensuring that high clinical
17 standards are maintained:

18 *Monitoring and evaluation of services rendered, if people are being*
19 *monitored and supervised on a regular basis, they tend to work better than*
20 *when they are left on their own. (Interview PA5 Radiographer).*

21 22 **Discussion**

23 The results suggest the importance of effective policy formulation and successful models of
24 implementation to achieve role extension in diagnostic radiography. This work presented
25 here can therefore serve as a guide towards policy formulation in Ghana.

26 The aphorism 'If you fail to plan, then you have planned to fail' is popular in Ghana. Our
27 findings emphasise that planning is indeed key to the process of policy formulation and
28 implementation in relation to extending the scope of practice of radiographers. It was seen
29 as critical to have a broad consultative process that incorporates the views and concerns of
30 service users, healthcare personnel and professional bodies⁴⁹. The outcome of this
31 consultation should help inform policy development for clinical services. Established
32 international consensus making models, such as the St Gallen panel of experts,⁵⁰ could be
33 adopted with an invited panel of experts and stakeholders to help make the key decisions
34 that would guide the introduction and practice of role extension in diagnostic radiography in
35 Ghana. For example, the key decision about who should act as the regulator. This consensual
36 approach would seek to circumvent professional power plays and agendas.

1 Given that the proposed clinical roles are traditionally within the scope of radiologists, it is
2 likely the Ghana MDC would want to be involved in the regulation of these practices. Similar
3 roles are already being taken up by a small number of radiographers who are regulated by
4 the AHPC in Ghana. The AHPC could also justifiably seek to regulate role extension.
5 Interestingly, advanced practice in radiography in the UK does not have separate regulation
6 from the Health and Care Professions Council (HCPC), but practitioners are required to
7 practise within the standards of practice and ethics of the HCPC and CoR.^{51, 52} It may be that
8 Ghana will be better served learning from such practices.

9 Professional sensitisation to change should involve explaining the potential benefits of role
10 extension to healthcare and, of critical importance, that role extension is seen as
11 complementary to the work of radiologists and not as a competitive professional boundary
12 issue. It is important that the views of the general public, as the key service users, are sought
13 before implementation of any new policy. It will also be critical for public confidence that
14 leadership of the various stakeholder groups publicly show support for the policy, as was the
15 case of the UK with both the RCR⁵³ and SCoR⁵⁴ issuing different statements of support.
16 However, our data indicate that the specific conditions of effective role extension policy
17 implementation in Ghana may be different from those of some more developed countries.

18 Radiographer participants revealed the need for regulation to set out legally the approved
19 education required for a colleague to take part in role extension. Studies have shown that
20 with appropriate education and training radiographers are comparable to radiologists in
21 image interpretation^{55,56} These regulations should include programmes that have been vetted
22 and involve institutions accredited externally by an approved body (such as in the UK where
23 programmes and institutions are vetted by the CoR before being given approval).⁵⁷ This, it is
24 believed, would curtail the proliferation of unregulated programmes purporting to offer
25 education for role extension. However, the dire shortage of radiologists in Ghana might also
26 serve as a hindrance due to the low number of radiologists available to take part in the
27 education and training of radiographers for extended roles. However, appropriately qualified
28 radiographers in academia could also play a greater role in supporting the education and
29 training of radiographers for extended roles.

30 These data indicate the importance of the conditions of service and rewards for extended role
31 practitioners being part of policy regulations, as this would serve as an incentive and would
32 motivate radiographers to adopt extended roles. If there is no reward for pursuing further
33 education and assuming additional responsibilities, there is likely to be apathy from
34 radiographers towards such a policy. Paterson et al⁵⁸ support this finding in a review article
35 on radiographer reporting, developing a policy and practice guide in the UK. Their argument
36 for appropriate rewards for radiographers engaged in reporting is likely to be even more
37 relevant in Ghana.

38 For Ghana it is of prime importance that the geographic areas in which radiographers can
39 practise after successful completion of role extension education are regulated by government

1 policy. This will ensure that qualified radiographers being deployed in areas where their
2 services are most needed is unlikely to face resistance from the radiologists. One solution
3 would be that radiographers enrolling on an education programme for role extension would
4 have been nominated by a hospital that requires their services and they sign a contract with
5 that hospital to practice for a fixed period after successful completion of the programme. The
6 policy should also determine the scope of practice of radiographers after successful
7 completion of their education. Qualified radiographers in remote settings would then have a
8 clear delineation of competency levels and would then be less likely to attempt to practise
9 beyond these. Where a lack of radiologists might translate into a radiographer practicing
10 beyond their scope, the threat of sanctions could act to counteract this professional pressure.

11 Our data indicate that regulation should also outline standards of practice and conduct for
12 radiographers taking part in role extension. It is important that there is a distinction made
13 between the generic code of practice for general radiography practice and a specific code of
14 practice for extended practice. Radiographers should be made accountable for their action
15 (or inaction) and would have to adhere to the established standards of practice and conduct
16 set out in the policy.^{51,52} In the UK the quality assurance of radiographer reporting is
17 determined by the national occupational standards and best practices, this should not be any
18 different in Ghana.⁵⁹ Failure to adhere to these standards could be penalised and the severity
19 of the punishments determined by the nature of the offence. It is proposed that practitioners
20 will be assigned an individual PIN and will be required to indicate this number on any work
21 they have done. This will aid in auditing and monitoring of performance. Data from such
22 auditing and monitoring can then be used to offer training in the form of continuous
23 professional development. The monitoring and auditing could be conducted periodically by
24 key stakeholders agreed in advance.

25 Advances in technology provides an opportunity for the use of Artificial Intelligence (AI) in
26 image interpretation. This technology alerts reporting staff of abnormalities in preliminary
27 screening. Remote reporting is also another possible solution. However, for a country like
28 Ghana where internet access is not only unreliable but unavailable in most rural areas these
29 are not always workable solutions.

30 The strength of the study is the inclusion of professional stakeholders, however the absence
31 of patients in the participants is a limitation. The findings of the study give a broader
32 understanding of policy formulation towards role extension in low resource countries
33 particularly in sub-Saharan African because the culture and available resources in these
34 countries are similar largely. The findings may not apply to any other setting. Future studies
35 to determine areas of need in Ghana that will require role extension is recommended.

37 **Conclusion**

38 The study showed the need for effective policy to underpin the introduction and practice of
39 role extension in diagnostic radiography. These data indicate that the policy adopted should

include regulation, clarification about what should be regulated and who the regulator should be. The study also established what an effective policy should constitute and the scope and standards of practice that should guide role extension in Ghana. The study also proposed the need for a broad consultation of all key stakeholders in an internationally accepted consensus- building model to provide radiography services fit for the future in Ghana.

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