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Narrative Review

Regulation of diagnostic radiography education and clinical practice: A comparative document analysis of Sub-Saharan Africa and international guidelines

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ABSTRACT

Objectives: This integrative document analysis examines statutory and regulatory scopes of practice and educational requirements that inform diagnostic radiographer registration in Sub-Saharan Africa, concisely comparing global standards. A methodical literature synthesis employed a modified Donabedian model and identified key themes concerning regulatory structures and processes influencing radiography education and practice.

Key findings: Seventy-six documents from Africa (n = 51, 67.1 %), Australia (n = 9, 11.8 %), North America (n = 8, 10.5 %) and Europe (n = 8, 10.5 %) were examined. Considerable global regulatory variability exists in the scope of practice regarding autonomy levels and practice areas for diagnostic radiographers. The depth and complexity of local training influence these variations. Some regulatory bodies (Namibia, South Africa, the UK and Canada) require pre-registration diagnostic radiographers to be proficient in projection radiography, CT and MRI, with stricter ultrasound and nuclear medicine restrictions. In contrast, other frameworks (Zambia, Zimbabwe, Kenya, Nigeria, Ethiopia, Rwanda, and Australia) allow a broader scope of practice. In the USA, regulations require single-modality training with additional educational requirements for multi-modality registration. The study further identified emerging attributes related to entry-level diagnostic radiographer competency profiles in regulatory documents.

Conclusion: The identified variabilities highlight the need for reformation and standardisation in the international scope of practice policies. This reform should integrate emerging and threshold skills in competency profiles. These changes are crucial for adapting radiography education and practice to meet evolving healthcare demands. Additionally, this will enhance workforce mobility and improve the quality of patient care.

Implications for practice: Regulatory bodies should champion current scope of practice reforms with key stakeholders to enhance global radiography workforce mobility and explore new regulatory models supporting graduates' transition into the workplace.

Introduction

Patient safety and quality of care partly depend on the effectiveness of Health Practitioner Regulation (HPR) Systems.[1] These systems are gaining global recognition as fundamental pillars in ensuring the healthcare workforce's availability, accessibility, acceptability, quality, and sustainability.[2–4] The World Health Organisation mandates HPR systems to fulfil key roles, including workforce licensure and registration, establishing and approving standards of pre-registration education programmes, delineating codes and scopes of practice, facilitating continuous workforce development, and enforcing disciplinary measures in cases of misconduct.[5] Furthermore, HPR systems set equitable standards across the healthcare workforce and impact workforce movement. However, difficulties continue to exist in the national and

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international workforce landscape regarding the education, recruitment, and retention of high-quality, skilled healthcare professionals.[6]

State legislatures and licencing bodies regulate health practitioners by aligning the healthcare workforce with patient needs. These regulatory entities address disparities between the available healthcare labour pool and patients' needs.[7,8] Their decisions influence task assignments within the industry and impact the quality of patient care. While regulating healthcare practitioners and educational programmes enhances patient and public safety, evidence suggests longstanding concerns in certain circumstances. These include instances where regulation has led to adverse effects, such as concealing medical errors and professional misconduct due to fear of litigation[9] or the misuse of regulatory systems by those in authority for financial gain rather than improving education and practice standards for healthcare professionals.[10]

Despite the current healthcare workforce shortages and projected deficits by 2030,[1] diagnostic imaging remains highly regulated in many nations, just like other healthcare disciplines. Different protected titles refer to medical imaging professionals based on the international standards of occupation[11] and, by extension, within and cross-country HPR systems.[12–21] This variety of titles underscores the global differences in medical radiation practices and the expanding scope of these professions. In this article, unless otherwise stated, we adopted the title radiographer to include diagnostic imaging professionals meeting pre-registration educational and training needs required to be admitted to the respective statutory practice registers.[22]

A study by the International Society of Radiographers and Radiological Technologists (ISRRT) shows that 57 % of radiography societies globally report a deficiency in radiographers now and in the future.[22] Similar observations have been documented over the past twenty years.[23–26] We argue that one of the global challenges contributing to inequitable workforce distribution in radiography is the absence of uniform scopes of practice and competency profiles across countries. This limits professional mobility as different expectations exist. However, establishing threshold standardised radiographer scopes of practice that are suitably linked to educational pathways and career frameworks could help overcome this hurdle.[23,25,27] Radiography practice regulation reform offering more congruent practice scopes with pre-registration education programme-level graduate outcomes is needed.

Furthermore, as this research team highlighted in related work, the diverse range of expected competencies among current and future pre-registration radiography graduates[27] highlights the critical need to consolidate and synthesise evidence on existing radiography regulation and accreditation systems. This consolidation is essential, specifically focusing on practice scopes, standards of practice and education, as these are vital benchmarks for current and future curriculum planning groups.[28–33]

Notwithstanding the complexity of investigating the healthcare regulatory landscape,[9,34] this study investigates the sparse literature concerning pre-registration radiographer practice, standards, and educational programme requirements in sub-Saharan Africa, comparing it to some global trends—an area that remains underexplored in this domain.[35–37] By conducting an integrative analysis of legislative documents, the study seeks to contribute to reviewing preregistration radiography practice scopes, curriculum development, and the alignment of graduate roles, both within the region and globally. Guided by the question, “What criteria and proficiency standards determine a radiographer's registration and admittance into statutory practice registers internationally?” this study aims to (i) define and analyse the scope of practice for pre-registration radiographers within selected regions, (ii) compare entry-level practice standards and regulatory requirements across global contexts, and (iii) identify emerging practice areas reflected in regulatory documents across jurisdictions.

Methods

Research design

This study used the READ approach, developed by Dalglish and colleagues[38] in health policy research, who drew on the work of Bowen (2009)[39] to develop this methodological framework. The focus was on grey literature related to pre-registration radiographers' scopes of practice. In this research, we employ GreyNet's characterisation of grey literature, which encompasses documents produced by governmental bodies, academic institutions, and non-profits rather than those managed by commercial publishing entities.[40,41] A modified Donabedian framework—categorising quality into structure (context), process (methods), and outcome (results)—was applied to evaluate regulatory systems governing radiography education and practice.[42]

Search strategy

A structured, three-stage iterative search was conducted with guidance from a professional librarian. Keywords such as “diagnostic radiography,” “education,” “clinical practice,” “scopes of practice,” and “health practitioner regulation” were used across SCOPUS, PubMed, and EBSCOhost. The strategy was refined based on initial results and adapted for specialised journals. Limited peer-reviewed literature was found, mainly from Europe,[36,43] Korea[20] and Australia.[37] Given the limited availability of peer-reviewed literature on the subject, especially from sub-Saharan African countries, the jurisdictional focus of our inquiry, the search was broadened to include grey literature. National regulatory and professional body websites were reviewed for relevant statutory or policy documents. Where no online presence existed, RAD-AID country reports[44] provided additional insights. This comprehensive approach ensured the inclusion of peer-reviewed and grey literature relevant to radiography regulation and education.[45]

Eligibility criteria

We included documents focusing on the scope of practice for radiographers and guidelines for pre-registration education from a regulatory standpoint, encompassing policy papers, legislation, and reports from governmental or professional bodies. Only English sources were considered. Although no date restrictions were imposed, each country or region's most recent regulatory guidance was utilised, particularly in sub-Saharan Africa, where regulatory frameworks may not keep pace with advancements in technology and health care.

Quality assessment

In this study, the decision was made to forgo the application of the GRADE (Grading of Recommendations, Assessment, Development, and Evaluation) Framework[46] for grading the certainty of evidence due to the nature of the grey literature reviewed. Instead, a parallel appraisal by two authors ensured rigorous, transparent evidence selection, with a third author resolving any disagreements.[47]

Data extraction, analysis and synthesis

Two independent reviewers, (ES) and (TNA), screened the full texts before data extraction to assess documents for eligibility.

Table 1
Abstracted bibliographic information and document attributes.

Bibliographic information	Document attributes	Description
Authors	Content focus	Scope of Practice Education and Practice requirements Health Systems and radiology resources
Year of Publication	Type of Document	Professional association publication Regulatory body publication Government publication
Title of the document	Purpose of Document	Regulatory Research and development Instruction
Continent/Country	Stakeholder relevancy	Educators Regulators Practitioners

Subsequently, a third reviewer (JT) helped resolve the differences and agreed on which documents to add and what data to extract[47] (see Supplementary File 1). All included documents were imported into NVivo, qualitative data analysis software (v.12.5) that facilitates the organisation, analysis, and interpretation of large qualitative data sets. Table 1 further provides an overview of the file classifications for all the included documents. A codebook was developed using NVivo (version 12.5)[48], with main categories deductively determined using the adopted Donabedian conceptual framework[42] and several subthemes inductively developed and coded by ES[48,49] (Supplementary file 2) and cross-checked by (TNA and JT) for accuracy and appropriateness.

Furthermore, to aid in distilling and confirming inductively developed key ideas from the included documents, a query for word frequency was run in NVivo to generate the word cloud. Ideas were identified and coded using the most frequent word and tree map functions to deductive and inductive themes (Fig. 1).[50] We employed a systematic approach to enhance our data analysis and establish a traceable process for developing inductive themes. This involved implementing the READ methodological data analysis framework in NVivo, following the step-by-step procedure outlined in Table 2.

During the data analysis phase, ES and TNA further synthesised to define a list of threshold competencies identified in the regulatory documents for pre-registration radiographers. The third reviewer (JT) verified this list (Table 3).[47]

Each competency was assessed and scored based on the autonomy levels of radiographers as outlined in regulatory documents across jurisdictions. Table 4 shows how the identified competencies were scored to generate infographics on the scope of practice (Figs. 4 and 5), as shown in the findings section.

Results

Seventy-six documents were examined, comprising 67.1 % (n = 51) from Africa, Australia (n = 9, 11.8 %), North America (n = 8, 10.5 %) and Europe (n = 8, 10.5 %). These are mostly from grey literature sources that predominantly focus on the radiographer's scope of practice and the regulation of academic programmes. A case classification sheet describing all the sources used to identify the main themes from the content analysis is available as an additional file (see Supplementary File 1). However, not all sources listed on the classification sheet are referenced because the main findings were synthesised and prioritised accordingly. Key deductive themes were identified based on the adopted modified Donabedian conceptual framework,[42] regulatory structures, regulatory processes, and regulatory outcomes. As shown in Fig. 2, a series of subthemes inductively emerging from the document analysis were developed.

Table 2
Step-by-step process of how we mapped the READ approach[28] to the analytical process with NVivo Functionality.[37]

Analytical Process	Application of Process in NVivo	Objective	Iterative process
1. Ready your materials	Documents were manually imported from regulatory websites into NVivo, and then each publication was entered as a case, followed by file classification (See Appendix 1). Cases acted as units of analysis, storing all text from the publication. Read data actively, analytically and critically	 **Manage data** through open and hierarchical coding in NVivo  **The reordering of the coding process marks the descriptive phase.** **Drawing out analytical Conclusions,** drafting memos through NVivo	 Assigning data to refined concepts to portray meaning.  Assigning data to themes/concepts to portray meaning. Assigning meaning
2. Extract data	Open coding: what was analytically relevant across the entire dataset was coded to each coding label. Organising and gathering the codes into initial potential themes		
3. Analyse data	The nature or characteristics of each theme and the overall storylines that the analysis tells were identified.		
4. Distil your findings	Analytical commentaries or memos were generated, and conclusions relating the analysis to the research objectives were made.		

Figure 1. Word cloud showing the most frequently used words in the included documents.

Table 3
Core responsibilities of diagnostic and therapy radiographers.

Core competency	Description of skill
Technical proficiency	Demonstrate competence in clinical skills, including the operation of radiographic equipment safely and accurately, and perform a range of radiographic examinations across different imaging modalities such as X-ray, ultrasound, computed tomography, magnetic resonance imaging, nuclear medicine, mammography and angiography.
Quality image acquisition, evaluation and reporting	Provide high-quality imaging services in healthcare facilities, ensuring images meet diagnostic quality standards and medico-legal requirements, with the ability to report findings in some regions.
Quality Assurance and Improvement	Regularly check imaging equipment for malfunctions, perform quality control tests, and report any faults immediately.
Patient care	Observe patients' well-being, maintain contact during their examination, and provide support and reassurance, considering their physical and psychological needs.
Phlebotomy	Provide safe and effective administration of pharmacological agents, including contrast media, by radiographers, requiring knowledge of pharmacology, recognition of adverse reactions, adherence to legal standards, and effective patient communication.
Collaboration	Work collaboratively with radiologists and other healthcare professionals to produce images for various procedures.
Health and Safety Compliance	Understand and observe health and safety regulations, including infection control policies and ionising radiation regulations, to protect themselves and others.
Record Management	Accurately record imaging identification and patient documentation, ensuring compliance with privacy and confidentiality protocols.
Continuing Professional Development	Engage in ongoing professional development to stay updated with technological advancements and healthcare practices.
Supervision and Education	Supervise students and auxiliary staff, providing appropriate education, training, and mentoring.
Research Participation	Participate in research studies where imaging is required, adhering to national guidelines.
Radiotherapy Techniques and Rationale	Understanding and application of various radiotherapy techniques, equipment and their rationale in treating both malignant and non-malignant conditions
Radiology Information Systems	Understanding and application of Radiology Information Systems.
Administrative Responsibilities	Performing administrative duties for managing imaging services and contributing to developing and implementing departmental policies and procedures.

Table 4
Scoring criteria used to demonstrate radiographer autonomy levels across jurisdictions.

Points	Definition
1	No autonomy: The radiographer can only assist and is not permitted to perform the task independently
±	There is no identifiable regulation on the scope of practice for radiographers addressing competency or skill.
2	Limited autonomy (under direct supervision): The radiographer can perform the task under direct supervision. They can execute the task but require a senior professional to oversee, approve, or review the work before the final steps are taken.
3	Moderate autonomy (under general supervision): The radiographer can carry out the task without constant oversight but must follow established protocols. While they do not need someone physically present, a supervising professional periodically reviews and audits their work to ensure consistency with the requirements.
4	High autonomy (Independent practice with oversight): The radiographer can perform tasks independently and make routine or standard decisions regarding the imaging process. They only consult with other professionals for more complex diagnostic imaging processes.

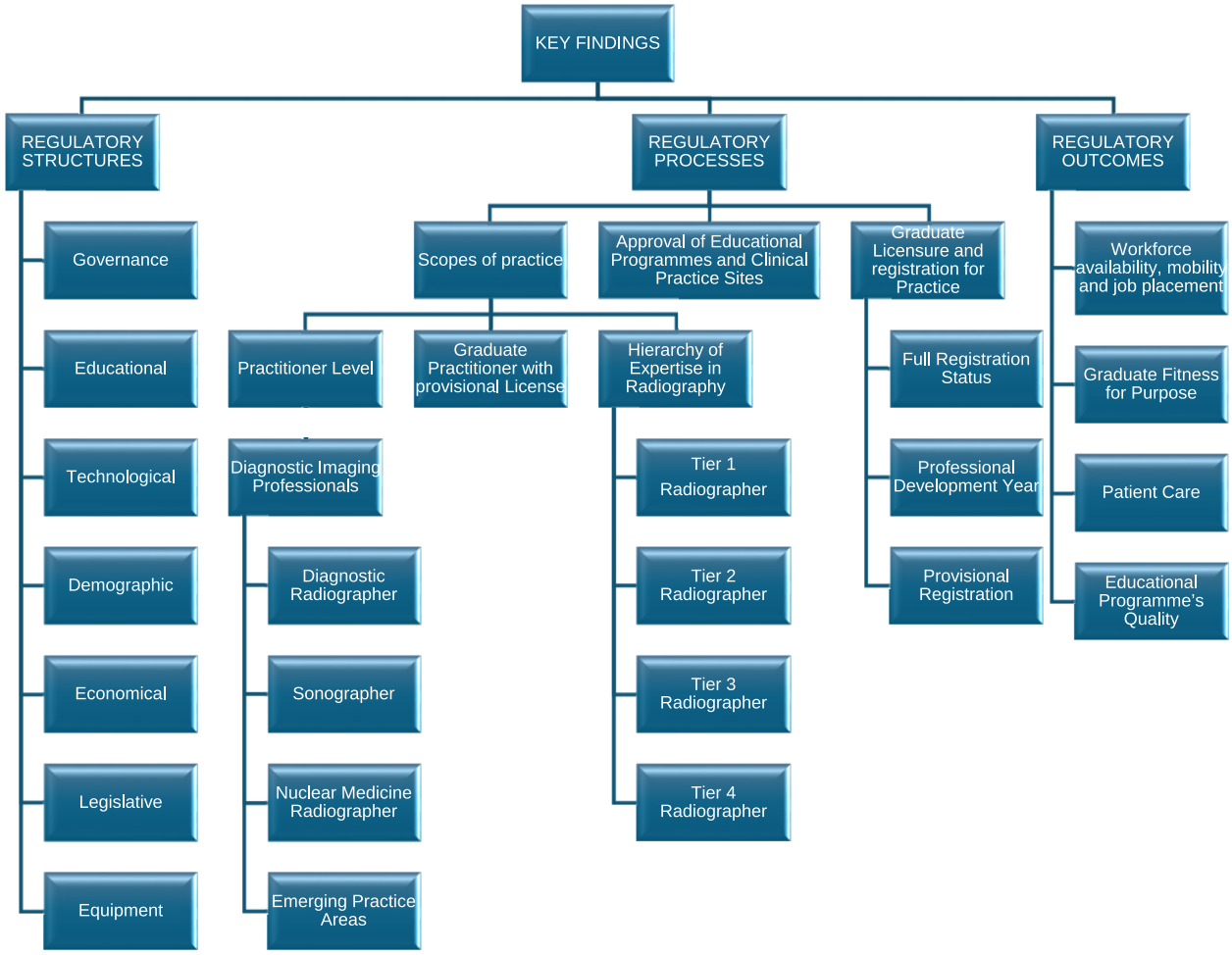


Figure 2. Shows an overview of deductive themes categorised by structures, processes and outcomes, with inductive subthemes under each category.

Conceptual themes

Theme 1: regulatory structures

This deductive theme addresses the broader context within which the acquisition and application of radiographic knowledge and skills occur, specifically within regulatory, educational, and practice-oriented structures. The regulatory structure involves various interrelated factors that govern radiography practices and educational programmes, including governance, education, technology, demographics, economics, legislation, and equipment (Table 5).

Theme 2: radiography regulatory and governance processes

Globally, radiography has increasingly evolved into a regulated profession overseen by various frameworks such as government-issued umbrella laws,[16] acts of parliament, multi-profession government-led regulatory agencies[51] or self-regulating professional bodies. Most jurisdictions included in this analysis have laws or legislative instruments regulating radiographers. High-income countries such as Ireland,[52] Canada,[53] and the USA,[12] and low-middle-income countries such as Kenya[54] and Nigeria[55] have self-regulating radiography professional agencies. Like many other countries in sub-Saharan Africa, Zambia[56] has a government-led,

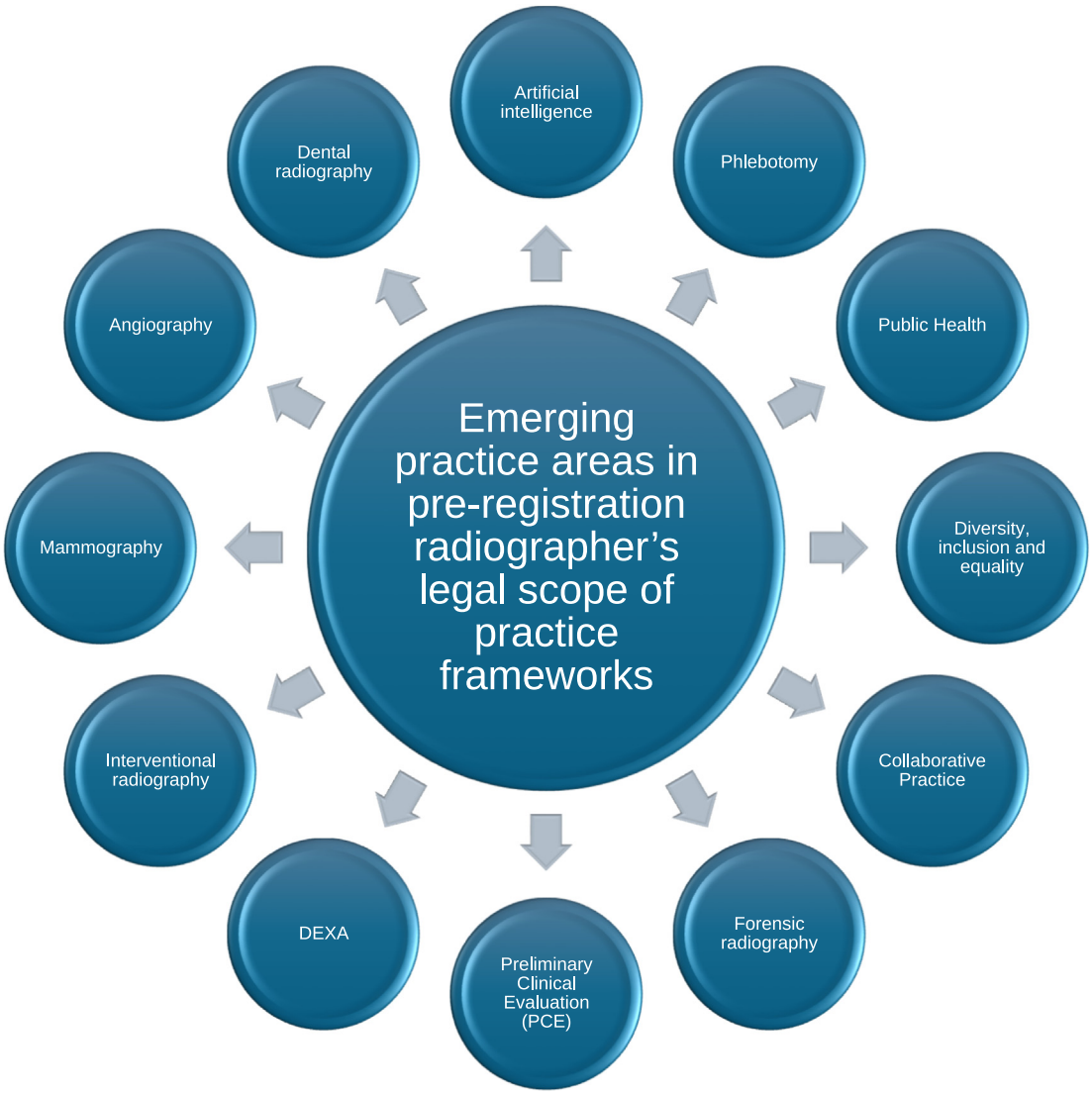


Figure 3. Emerging practice areas in pre-registration radiographers' scopes of practice as discussed in regulatory documents across different jurisdictions.

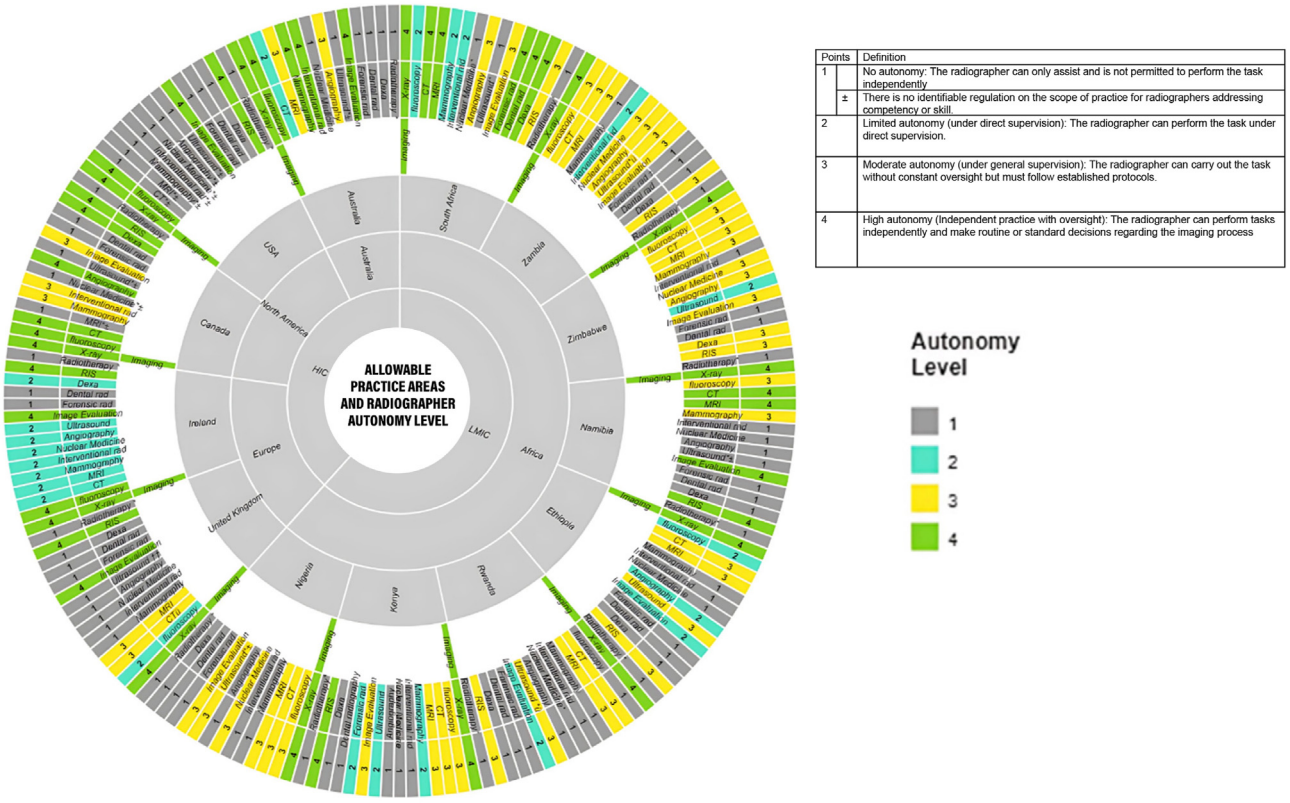
multi-profession regulator under its Ministry of Health. Established by the Health Professions Act, these bodies register health practitioners. Three subthemes emerged under regulatory processes: pre-registration radiographer scopes of practice, approval of clinical education programmes and placement sites, and graduate licensure and registration processes.

Subtheme 2.1: regulation of pre-registration diagnostic radiographers' scopes of practice. Scopes of practice outline the procedures radiographers are trained and authorised to perform, ensuring safe and lawful practice under regulatory standards. This document analysis reveals several key findings (Figs. 4 and 5):

i. Regulatory frameworks vary regionally in defining the imaging modalities pre-registration radiographers can safely perform and the levels of autonomous practice.
ii. In high-income countries, radiographers have greater autonomy in CT and MRI but, often require further certification for multi-modality registration.
iii. In resource-limited settings, broader modality practice is permitted from initial qualifications, with moderate autonomy across modalities.
iv. Globally, high autonomy is typical in projection radiography and non-imaging skills; autonomy in other modalities varies.
v. Emerging practice areas are increasingly reflected in selected legal scopes but are often absent in others.

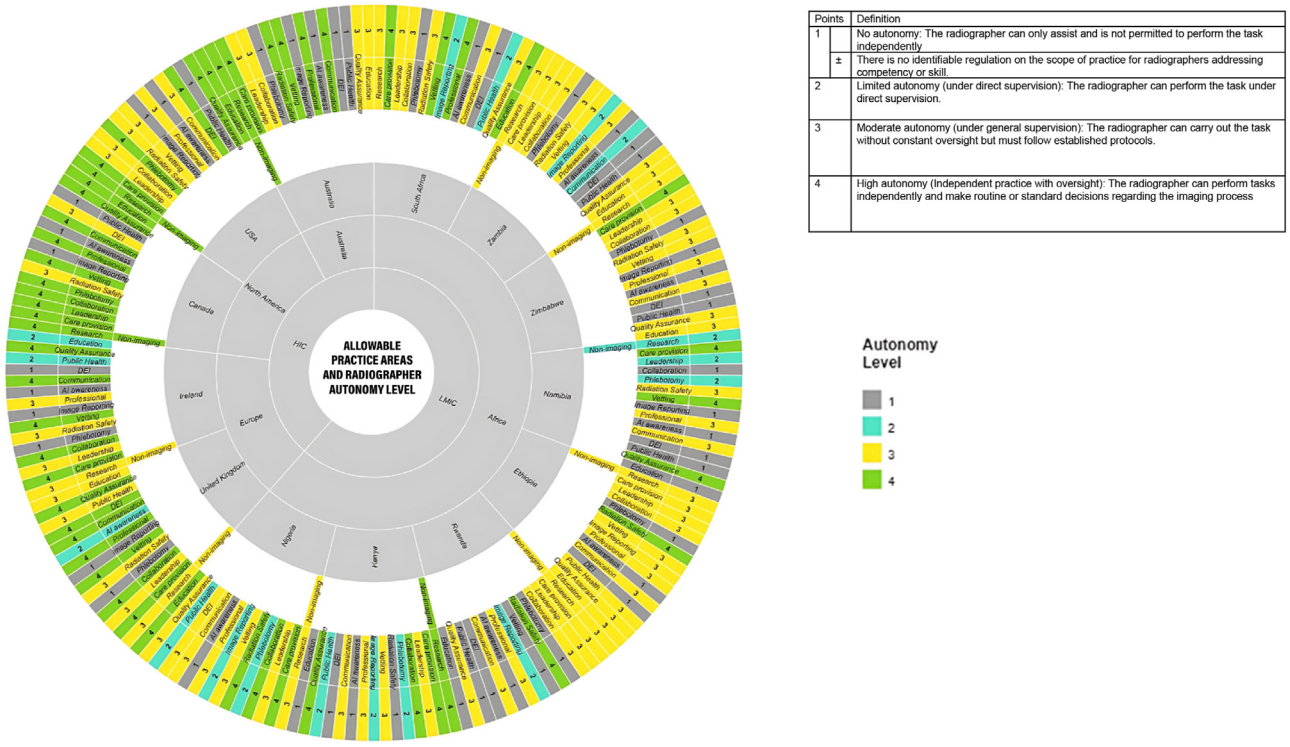
Figs. 4 and 5 below highlight the imaging and non-imaging services that pre-registration diagnostic radiographers can provide and the levels of autonomy they are expected to perform as defined by country-specific practice regulations.

Subtheme 2.2: licensure and registration requirements to practice. In several jurisdictions, national licensure examinations are required upon completing accredited radiography programmes.[57,58] Many also mandate a period of provisional registration under supervision, described using terms like supervised practice[18,57] (Australia),[59] community service year (South Africa),[51] preceptorship (United Kingdom),[60] provisional registration or professional development year (Zambia).[57] Despite varied terminology, these frameworks serve the same purpose: supporting graduates' transition to full registration. Notably, some countries, such as South Africa and the UK, grant full registration post-



Points		Definition
1		No autonomy: The radiographer can only assist and is not permitted to perform the task independently
	±	There is no identifiable regulation on the scope of practice for radiographers addressing competency or skill.
2		Limited autonomy (under direct supervision): The radiographer can perform the task under direct supervision.
3		Moderate autonomy (under general supervision): The radiographer can carry out the task without constant oversight but must follow established protocols.
4		High autonomy (Independent practice with oversight): The radiographer can perform tasks independently and make routine or standard decisions regarding the imaging process

Figure 4. Allowable imaging practice areas and radiographer autonomy levels as defined by country-specific practice guidelines.



Points		Definition
1		No autonomy: The radiographer can only assist and is not permitted to perform the task independently
	±	There is no identifiable regulation on the scope of practice for radiographers addressing competency or skill.
2		Limited autonomy (under direct supervision): The radiographer can perform the task under direct supervision.
3		Moderate autonomy (under general supervision): The radiographer can carry out the task without constant oversight but must follow established protocols.
4		High autonomy (Independent practice with oversight): The radiographer can perform tasks independently and make routine or standard decisions regarding the imaging process

Figure 5. Allowable non-imaging practice areas and radiographer autonomy level as defined by country-specific practice guidelines.

Table 5
Key findings on the structural context within which radiography practice regulatory systems function or exist in most sub-Saharan African countries.

Subtopic	Key messages
Governance	Many countries have established regulatory bodies to oversee radiography practice. For instance, the Society of Radiographers in Kenya and the Tanzanian Medical Radiology and Imaging Professionals Council regulate the profession.
Education	In sub-Saharan Africa, education and training programmes for radiographers are critical. However, most RAD-AID country reports (grey literature) in the region highlight inadequate educational resources, and there are no training institutions for radiographers in some countries. For instance, Botswana and Cape Verde currently do not offer radiography education. Among those that offer such programmes, some report insufficient training materials. This contrasts with reports from high-income countries, where most educational institutions are well-equipped with training resources.
Technology	Most RAD-AID country reports from sub-Saharan African nations highlight a significant disparity in the distribution of advanced imaging technologies like MRI scanners, PET scanners, newer generation CT, and Radiology Information Systems (RIS), with urban areas having considerably better access than rural regions.
Demographic	The radiography workforce is often insufficient to meet the population's demands. This pattern is seen in low-income countries like Gambia, with a reported ratio of 0.1 radiographers per 10,000 people and a 12 % shortage in the United Kingdom.
Economic	Funding for radiology services and education often comes from government sources, grants and donations. However, economic constraints limit the availability of necessary resources and equipment.
Legislation	Legislation is crucial in establishing radiographers' scopes of practice, education standards, and public protection. For example, the Health Professions Council of South Africa, through the Radiography and Clinical Technology Board, is mandated to prioritise public safety by ensuring adherence to ethical and legal standards of practice within radiography.
Equipment	Many countries in sub-Saharan Africa face challenges with outdated or broken radiological equipment, which affects timely and quality healthcare service delivery.

graduation while still offering structured workplace transition support.

Subtheme 2.3 regulation of educational programmes and clinical placement sites. Eight jurisdictions included grey literature sources directly addressing the regulation of educational programmes and clinical practice sites. Literature on this subject included Africa (n = 4), Europe (n = 2), North America (n = 2), and Australia (*n* = 1). Three themes were identified in this subcategory.

Subtheme 2.4 curriculum content and qualification level. Regulatory frameworks emphasise that radiography curricula must be evidence-based, reflect current practice, and align with defined scopes of practice. While most require a baccalaureate-level education,[52,61,62] some African regions offer a diploma,[18,54,63] and the UK provides additional apprenticeship degrees[64] and master's degree pre-registration routes.[65] Qualification levels influence the scope of practice; however, some jurisdictions use a single register with a common scope, regardless of qualification. Given the link between qualification level and programme outcomes, this may lead to mismatches between graduate competencies and expected practice.

Subtheme 2.5 clinical training facilities. Regulatory bodies emphasise the importance of quality practice placements that reflect typical environments.[17,53,64,66–73] Education providers must offer appropriate sequencing, duration, and variety of placements to develop necessary skills and competencies. Although details such as clinical hours and instructor-to-student ratios differ, there is limited empirical evidence of the effectiveness of more specific requirements versus broader governance approaches.

Subtheme 2.6 clinical education instructors. Clinical education instructors play a critical role in practice-based learning by facilitating and assessing students in clinical settings. Most regulatory bodies mandate that instructors be registered professionals with relevant qualifications and experience. Education providers are responsible for supporting their ongoing development through regular training. Continuous professional development is essential for ensuring high-quality instruction, assessment, and feedback. Although competency frameworks for clinical instructors are limited in sub-Saharan Africa, models from the Australian Medical Radiation Practice Board,[59] the College of Radiographers,[74] and the Health and Care Professions Council offer valuable guidance for enhancing educator effectiveness.[60]

Discussion

This integrative document analysis explored how regulatory frameworks, scopes of practice, and radiographer educational requirements vary internationally. The grey literature synthesis highlighted key themes organised into regulatory structures, processes, and outcomes.

Radiographer scopes of practice: a multi-factorial phenomenon

Healthcare regulatory bodies aim to ensure public safety by overseeing professional scopes of practice and supporting ongoing education through legislation.[2,3,6,37,56,75] Although legislation provides a foundation for medical imaging service quality,[76,77] this study found significant global variability in pre-registration radiographer scopes of practice, particularly in autonomy levels and modality coverage.

In countries like Namibia,[16] South Africa,[51] the UK[75] and Canada[14] pre-registration radiographers must be competent in projection radiography, CT, and MRI, while ultrasound and nuclear medicine require additional credentials. Conversely, jurisdictions like Kenya,[54] Nigeria,[55] Ethiopia, Rwanda, and Australia permit broader practice, although ultrasound is often limited to basic applications. Zambia[18] and Zimbabwe,[78] expand this list to include nuclear medicine.

The USA,[79] takes a different route, training radiographers in a single modality at associate degree level (FHEQ levels 4–5),[80–82] with multi-modality practice only allowed after further education.

These differences raise concerns about the consistency of graduate competencies. A globally standardised pre-registration curriculum, as previously argued,[27] could enhance mobility, qualification recognition, and workforce preparedness.

Nevertheless, regulators in many jurisdictions increasingly expect entry-level radiographers to develop multi-modality competencies.[14,16,20,52,54,55,78,79,83–88] This model aims to reduce costs, address shortages, and improve service quality in developing and developed countries.

Specialised competency profiles exist for several modalities, including projection radiography,[84,89] ultrasound,[90] MRI,[91] nuclear medicine,[92,93] and CT[84] and are being adopted by regulators and employers. However, there is little empirical evidence on whether multi-modality-trained graduates meet clinical proficiency expectations.

Additionally, regulatory bodies have yet to consolidate these competency profiles or define threshold imaging and non-imaging skills for multi-modality pre-registration radiographers. As a result, educational programmes vary significantly in learning outcomes.[27] While it remains unclear whether the traditional three to four-year undergraduate degree,[64,68–70] an apprentice degree model[64] or MSc pre-registration programmes[65] adequately prepare students for multi-modality roles; evidence suggests employers increasingly prefer broad-skill radiographers.[20,81,94,95] These uncertainties are closely linked to unclear scopes of practice for unregistered imaging support staff models, who are increasingly seen as an innovative strategy to address workforce shortages.[96,97] The cited variability and jurisdictional restrictions in scopes of practice, core modality-specific outcomes and the changing landscape of service needs should be seen as key drivers for future pre-registration radiography scopes of practice reform.[98] Therefore, scope of practice reform, informed by stakeholder consultation, is necessary to align graduate profiles with service needs and minimise professional bias (Fig. 6).

Graduate work-readiness and effective workplace transitioning

Radiography leaders are interested in graduate work readiness and integration.[26,27,99–104] Governments and the World Health Organisation mandate regulatory bodies to ensure graduates are adequately prepared, effectively transition to the workplace, and become autonomous practitioners. This approach aims to support universal health coverage and healthcare service sustainability. Analysis of relevant documents revealed various methods to achieve and monitor this requirement. The 2023 HCPC guidelines[60] offer a systematic, principle-oriented preceptorship framework for newly registered professionals entering the workplace. Many regulatory bodies employ NLEs[56,58] to verify recent graduates' work readiness against a backdrop of concerns raised by the marketisation of education.[105,106]

HPR systems collaborate with other statutory actors to evaluate and endorse pre-registration radiography programmes and clinical training facilities. While evidence on the effectiveness of NLE and the involvement of HPR systems in educational programmes and clinical site accreditation is limited,[98,107] core elements of assuring graduate work readiness and workplace transition appear broadly consistent across various jurisdictions.

Emerging practice areas in pre-registration radiography scope of practice frameworks

The document analysis identified emerging practice areas. For this analysis, emerging concepts were defined as absent or underrepresented practice areas in pre-registration radiographers' legal competency frameworks. Notably, a triangulation of peer-reviewed studies with this regulatory document analysis confirms this assertion and further highlights an additional practice area with a growing global dialogue: sustainability in radiography.[108–110] However, to our knowledge, no regulatory body includes this practice area in its framework. Each of the fourteen emerging practice areas (Fig. 3), plus one (sustainability in radiography), is quite broad in scope. Thus, further exploration of these emerging concepts is recommended to define and operationalise them for potential inclusion in pre-registration radiography curricula.

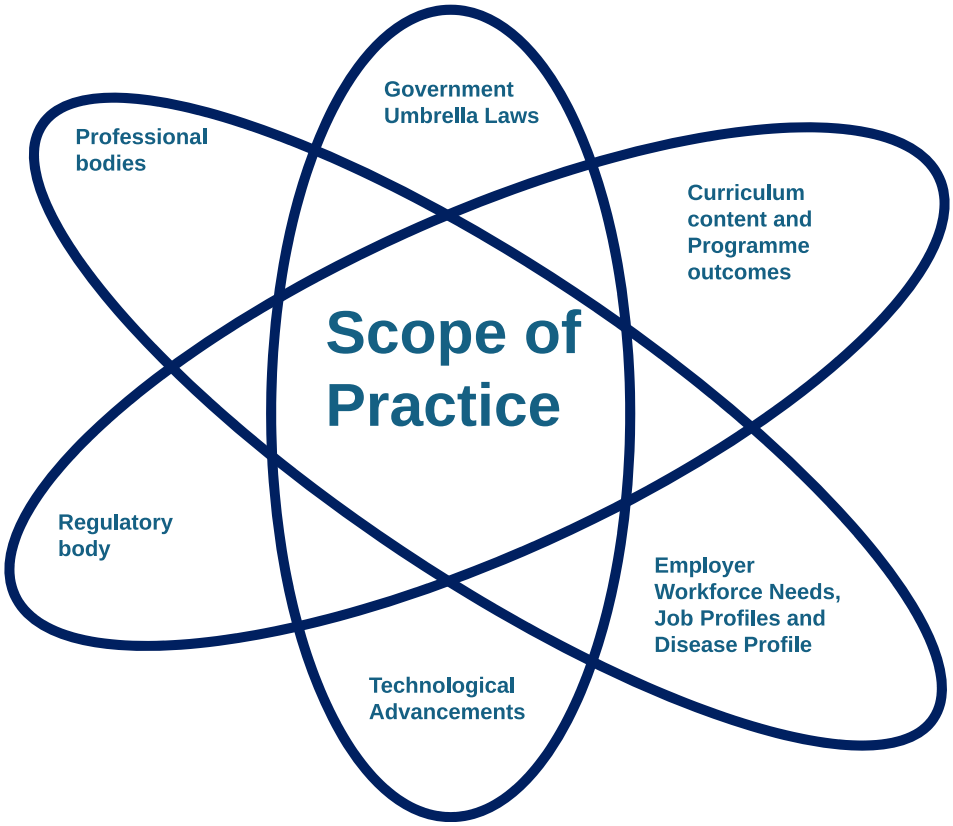


Figure 6. Key stakeholder engagement, scope of practice development and review (SOPDR) conceptual framework.

Study limitations

Two key limitations were identified. First, the nature of grey literature—primarily national laws and regulations lacking empirical data—required a departure from the GRADE framework. A tailored appraisal process was used to ensure transparency, though it does not align with standard GRADE criteria. Second, reliance on non-peer-reviewed grey literature may affect reliability and generalisability. Document analysis alone may miss practical regulatory nuances, highlighting the need for complementary empirical research, especially in underexplored contexts like sub-Saharan Africa.

Conclusions and implications for practice

This review highlights that jurisdictional regulations largely shape global variation in radiographers' scopes of practice, pre-registration training, and entry-level roles. To address this, policy reforms should align with international trends and evolving competencies to define future radiographer profiles. Regulatory and professional bodies are encouraged to introduce a transitional or provisional registration year, enabling new graduates to bridge academic learning and independent practice under supervision, enhancing service quality and professional growth.

As radiographer roles evolve, graduate competency frameworks must shift from a projection radiography focus to a model that reflects current and future workforce demands. Regulatory bodies should lead scope of practice reforms, collaborating with key stakeholders. Future research should investigate the impact of national licensure exams, early specialisation at level six of higher education, and the regulatory impact on patient outcomes. Additionally, a new multi-modality competency model at an advanced entry-level should be considered within regulatory frameworks.

During the preparation of this work, the author(s) used Paperpal to enhance sentence construction and readability and reduce the word count for the manuscript. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

Conflict of interest statement

None.

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