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EVALUATING THE READINESS OF RADIOGRAPHERS FOR ADVANCED PRACTICE ROLE OF FILM REPORTING AND RADIOLOGICAL ANATOMY

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ABSTRACT:

Background: Advanced radiography practice, particularly in film reporting and radiological anatomy, has emerged as a practical strategy for addressing radiologist shortages and improving diagnostic imaging services. However, the readiness of Nigerian radiographers to undertake these expanded roles remains inadequately understood. This study evaluated the readiness of radiographers for advanced practice, with emphasis on radiological anatomy knowledge, film reporting competence, curricular preparedness, and the perceived need for professional specialisation.

Materials and Methods: A cross-sectional survey design was employed among 110 radiographers. Data were collected using a structured questionnaire comprising demographic information, a radiological anatomy knowledge test, and Likert-scale items assessing readiness, curricular factors, and barriers to advanced practice. Descriptive statistics, correlation analysis, chi-square test, analysis of variance, and multiple regression were used for data analysis at a 5% level of significance.

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Results: The findings revealed a moderate level of radiological anatomy knowledge, with a mean score of 63.2%, while self-perceived readiness for advanced practice was also moderate (film reporting: mean = 2.79/5; radiological anatomy specialisation: mean = 2.74/5). Knowledge was not significantly associated with years of clinical experience, and self-rated confidence showed only a weak positive relationship with objective knowledge. Undergraduate preparation emerged as the strongest predictor of readiness for advanced practice, whereas formal post-qualification training was significantly associated with current involvement in reporting activities. Respondents identified inadequate image-based learning, limited supervised reporting opportunities, insufficient postgraduate training, and the absence of a formal advanced practice framework as major barriers.

Conclusion: The study concluded that although Nigerian radiographers possess moderate knowledge, significant curricular, educational, and regulatory deficiencies limit their preparedness. It recommends strengthening undergraduate radiography curricula through enhanced radiological anatomy and image interpretation training, establishing accredited postgraduate programmes in film reporting and radiological anatomy, and developing a national advanced practice framework to support role expansion and improve diagnostic imaging services in Nigeria.

Keywords: *Advanced radiography practice, film reporting, radiological anatomy, readiness, curriculum, radiographers.*

1.0 INTRODUCTION

The global landscape of healthcare delivery has undergone significant transformation over the past few decades, driven by advances in diagnostic imaging technology, increasing disease burden, and evolving patient expectations. Within this context, the role of the radiographer has expanded beyond conventional image acquisition to encompass a broader scope of clinical responsibilities. Advanced practice in radiography, particularly in the domains of radiological anatomy interpretation, and film reporting represents one of the most significant shifts in the allied health professions [1,2]. However, this shift demands a thorough re-examination of how radiography education prepares students for the realities of contemporary clinical practice.

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Radiographers, traditionally trained to perform diagnostic imaging procedures under the supervision and interpretation authority of radiologists, are increasingly being called upon to fulfill expanded clinical roles in many healthcare systems worldwide [3,4]. In high-income countries such as the United Kingdom, Australia, Canada, and the United States, advanced radiographer practitioners have been formally recognised as competent to perform preliminary clinical evaluations, produce image reports, and in some specialities, make referral decisions. This transformation has been reinforced by legislative backing, professional frameworks, and structured postgraduate pathways that equip radiographers with the requisite knowledge and clinical competencies for advanced roles [5,6].

In sub-Saharan Africa, including Nigeria, there is a significant shortage of radiologists, with fewer than 300 radiologists serving a population of over 200 million people in Nigeria [7], the formal advancement of radiographers into reporting and interpretive roles remains largely underdeveloped. The results in a widening service gap, where imaging studies are performed but not promptly reported, leading to delays in patient management, misdiagnosis, and suboptimal clinical outcomes [8]. This gap calls for urgent academic and policy-level discourse on the readiness of radiography graduates to take on advanced roles, and the curricular provisions that currently support or impede such readiness.

Radiological anatomy constitutes one of the foundational competency areas for any radiographer aspiring to advanced practice. A thorough understanding of normal anatomical variants, pathological alterations, and their Imaging Correlation is indispensable for accurate film reporting.[9] Yet, there is a growing concern among educators and clinicians that current radiography curricula, particularly within the West African context, do not sufficiently develop this competency to the level required for independent or semi-independent practice [10]. The depth of radiological anatomy instruction, the integration of clinical reasoning skills, and exposure to diverse imaging modalities in academic training settings remain areas of contention.

Furthermore, the concept of specialisation within radiography practice is gaining attention as a potential solution to the workforce gap in diagnostic imaging services. Subspecialties such as musculoskeletal imaging, neuroradiology, mammography, and International radiology each demand focused technical and interpretive expertise that general training programmes may inadequately provide [11,12]. A 2024 scoping review using global

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evidence on advanced and extended clinical practices of radiographers confirmed that specialised roles are present internationally but remain largely absent in the African context [13].

At a broader global level, low- and middle-income countries (LMICs) face a disproportionate imaging workforce deficit. Evidence suggests there are approximately 1.9 radiologists per million inhabitants in LMICs compared to 97.9 per million in high-income countries [14] this asymmetry reinforces the imperative for task-sharing models in which adequately trained radiographers assume expanded reporting roles to close the diagnostic gap. International bodies such as the International Society of Radiographers and Radiological Technologists (ISRRT) have consistently highlighted the urgency of expanding radiographer roles globally, particularly in regions with acute radiologist shortfalls [15].

This study, therefore, seeks to critically evaluate the readiness of radiographers for advanced practice, with a specific focus on radiological anatomy knowledge and film reporting competencies. It further interrogates the structural and curricular hindrances that may impede this readiness and examines the broader question of the need for specialisation within the radiography profession in Nigeria.

2.0 MATERIALS AND METHODS

2.1 Study Design and Participants

A descriptive cross-sectional survey design was used. The accessible population was estimated at approximately 150 eligible radiographers. Participants were practising radiographers with at least two years of post-qualification clinical experience who were engaged in or actively pursuing film reporting, radiological anatomy teaching or related advanced-practice activities. Purposive and snowball sampling were used. A minimum sample size of approximately 109 was obtained using the Yamane formula with a 5% margin of error; 110 respondents participated in the study.

2.2 Research Instruments

Data were collected using a structured self-administered questionnaire. Section A captured demographic and professional characteristics. Section B assessed radiological anatomy

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knowledge using 15 objective items. Sections C and D assessed self-perceived readiness for film reporting and radiological anatomy specialisation, respectively. Section E assessed undergraduate preparation, clinical placement, mentorship, organisational support and structural or regulatory factors influencing readiness.

2.3 Data Analysis

Data were analysed using IBM SPSS Statistics. Frequencies, percentages, means and standard deviations were used for descriptive analysis. Pearson correlation examined the relationship between knowledge and readiness. Group differences were examined using independent-samples t-tests and one-way ANOVA. Chi-square testing examined associations between categorical variables. Multiple linear regression was used to examine predictors of combined readiness. Statistical significance was assessed at $\alpha = 0.05$.

2.4 Ethical Considerations

Ethical approval was obtained from the Institutional Review Board of Lead City University, Ibadan, and relevant participating institutions. Informed consent, confidentiality and voluntary participation were maintained throughout data collection.

3.0 Results

This chapter presents the results of the data collected from 110 practising radiographers across Nigeria using a structured, self-administered questionnaire comprising five sections (A–E): demographic and professional background, radiological anatomy knowledge assessment, self-assessed readiness for film reporting, self-assessed readiness for radiological anatomy specialisation, and perceived factors influencing advanced practice readiness.

3.1 Demography of Respondents

Table 1: Demographic and Professional Characteristics of Respondents (N = 110)

Variable	Category	N	%
Age (years)	25-34	76	69.1%
	35-44	19	17.3%
	45-54	12	10.9%
	< 25	3	2.7%

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Gender	Male	70	63.6%
	Female	40	36.4%
Years of clinical experience	2-4 years	50	45.5%
	5-9 years	45	40.9%
	10-14 years	9	8.2%
	15-19 years	4	3.6%
	20 years and above	2	1.8%
Highest qualification	Bachelor's degree	82	74.5%
	Post-graduate diploma	26	23.6%
	M.Sc. / MBA	2	1.8%
Geopolitical zone	Southwest	71	64.5%
	North Central	17	15.5%
	Southeast	13	11.8%
	Southsouth	8	7.3%
	Northwest	1	0.9%
Received formal post-qualification training	No	79	71.8%
	Yes	31	28.2%
Currently undertakes film reporting	No, but actively seeking to do this	39	35.5%
	No, and not currently pursuing this	30	27.3%
	Yes, independently	24	21.8%
	Yes, under supervision	17	15.5%

Table 1 presents the demographic and professional profile of the 110 respondents. The majority were aged 25–34 years (69.1%), male (63.6%), and held a Bachelor's degree as their highest qualification (74.5%). Most respondents had between 2 and 9 years of post-qualification clinical experience (2–4 years: 45.5%; 5–9 years: 40.9%), worked in private hospitals or federal teaching hospitals, and practised predominantly in the Southwest geopolitical zone (64.5%). Only 28.2% had received any formal post-qualification training in film reporting or radiological anatomy, while 21.8 % and 15.5% currently undertake

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film reporting independently and under supervision respectively; the remainder (62.8%) do not currently report.

Table 2: Cronbach's Alpha Reliability Coefficients

Scale	No. of items	Cronbach's α
Section C - Film Reporting Readiness (C1-C17)	17	0.883
Section D - Anatomy Specialisation Readiness (D1-D13,D15)	14	0.833
Section E - Perceived Influencing Factors (E1-E19)	19	0.751
C: Image Evaluation (C1-C5)	5	0.732
C: Report Formulation & Medicolegal (C6-C12)	7	0.808
C: QA & Self-awareness (C13-C15)	3	0.564
D: Anatomical Knowledge (D1-D5)	5	0.732
D: Teaching/Supervision (D6-D10)	5	0.786
E: Undergraduate Preparation (E1-E4)	4	0.61
E: Clinical Placement Quality (E5-E8)	4	0.677
E: Mentorship & Workplace Support (E9-E12)	4	0.389
E: Structural/Contextual Barriers (E13-E19)	7	0.66
Overall scale (C+D+E combined, C18 & D14 excluded)	50	0.921

Internal consistency of the multi-item Likert scales was assessed using Cronbach's alpha. The overall combined scale (Sections C, D and E; 50 items) returned an excellent alpha of 0.921. The full Section C (film reporting readiness, 17 items) and Section D (anatomy specialisation readiness, 14 items) scales returned good-to-excellent reliability (α = 0.883 and α = 0.833 respectively), while Section E (perceived influencing factors, 19 items) returned acceptable reliability (α = 0.751). At the sub-scale level, most blocks exceeded the conventional 0.60 acceptability threshold; the exception was the Mentorship and Workplace Support sub-scale (E9–E12, α = 0.389), which is likely attributable to E11 ("workload pressures limit time for supervision") being conceptually a barrier item embedded within an otherwise supportive-context block. All scales were retained given the strong reliability of the parent (full-section) scales.

Table 3: Item Facility Index (% Correct) for Section B Knowledge Items, Ranked

Item	% Correct
B12 — Spine — Mach effect	37.3%
B5 — MSK — elbow carrying angle	40.9%
B7 — MSK — os trigonum location	41.8%
B6 — MSK — lucent line, distal radius	46.4%
B4 — Chest — anterior junction line	52.7%
B15 — Knee — bipartite patella	54.5%

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B2 — Chest — aortopulmonary window	65.5%
B9 — Abdomen — psoas shadow	67.3%
B3 — Chest — NOT a normal variant	70.9%
B10 — Abdomen — Rigler's sign	70.9%
B8 — Pelvis — Köhler's teardrop	72.7%
B11 — Spine — atlantodental interval	76.4%
B13 — Applied — CT scout, liver margin	76.4%
B14 — Chest — silhouette sign	81.8%
B1 — Chest — right hemidiaphragm position	91.8%

The 15-item radiological anatomy knowledge test (Section B) produced a mean score of 9.47 out of 15 (SD = 2.36; Mdn = 9; range 3–15), equivalent to a mean of 63.2%. Using cut-offs of <50% (low), 50–74% (moderate) and ≥75% (high), 19 (17.3%) respondents demonstrated low knowledge, 69 (62.7%) moderate knowledge, and 22 (20.0%) high knowledge, this indicates that the majority of radiographers possess only moderate radiological anatomy knowledge, with a substantial minority scoring below the pass threshold typically expected for advanced-practice readiness.

Item facility (percentage correct) varied widely across the 15 items, from a low of 37.3% on B12 (the Mach effect on lateral cervical spine radiographs) to a high of 91.8% on B1 (chest hemidiaphragm position). Items relating to musculoskeletal and skull/spine anatomy (B5, B6, B7, B12) were consistently the weakest-performing, suggesting these are priority areas for curriculum reinforcement. Self-rated confidence in anatomy knowledge (B16, mean = 2.58/5, SD = 0.98) correlated weakly but significantly with actual test performance ($r = 0.273$, $p = 0.004$), indicating that radiographers' self-perceptions of their anatomy knowledge only partly track the competence demonstrated (Table 3).

Table 4: One-Way ANOVA Summary (Knowledge Score by Experience)

Experience group	**N**	**Mean**	**SD**	**F**	**P**
2-4 years	50	9.56	2.24	0.144	0.965
5-9 years	45	9.31	2.36		
10-14 years	9	9.89	2.93		
15-19 years	4	9.25	0.96		
20 years and above	2	9.5	6.36		

Note. *One-way ANOVA showed no statistically significant difference in knowledge scores across experience groups, $F(4, 105) = 0.144$, $p = 0.965$.*

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A one-way ANOVA found no statistically significant difference in knowledge scores across the five experience bands, $F(4, 105) = 0.144$, $p = 0.965$. Group means were closely clustered (ranging from 9.25 to 9.89 out of 15), indicating that radiological anatomy knowledge does not simply accumulate with years in clinical practice and is more likely dependent on deliberate post-qualification training and self-study rather than tenure alone(Table 4).

Table 5: Section C (Film Reporting Readiness) Item Means (Ranked)

Item	Mean (1–5)
C14 — Manage uncertainty; seek clarification rather than over-commit	3.77
C5 — Describe radiographic appearance of common pathology	3.75
C10 — Understand medicolegal implications of a signed report	3.52
C4 — Identify normal anatomical structures/variants across body regions	3.2
C13 — Identify potential interpretive errors in own reporting	3.15
C1 — Systematic search strategy — chest radiograph	2.88
C11 — Recognise findings requiring urgent escalation/referral	2.75
C9 — Integrate clinical history and indication into interpretation	2.68
C3 — Systematic search strategy — abdominal radiograph	2.6
C7 — Describe location, morphology and extent of abnormalities	2.59
C12 — Understand governance/accountability structures for reporting	2.56
C2 — Systematic search strategy — musculoskeletal radiograph	2.56
C15 — Aware of limits of own interpretive competence/scope	2.47
C6 — Formulate a complete, correctly structured written report	2.45
C8 — Construct clinical impression / differential diagnosis	2.4
C16 — Overall ready to undertake independent film reporting	2.14
C17 — Undergraduate training adequately prepared me for reporting	1.87

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Table 6: Section D (Anatomy Specialisation Readiness) Item Means (Ranked)

Item	Mean (1–5)
D15 — Support a formal Radiological Anatomy Specialist designation	3.97
D13 — Would benefit from further training before full readiness	3.85
D5 — Identify anatomy across >=2 imaging modalities (e.g., plain film & CT)	3.07
D4 — Correlate 2-D projection anatomy with 3-D structures	3.02
D7 — Provide expert guidance/feedback to junior staff or students	2.62
D2 — Identify/describe complex or atypical anatomical presentations	2.59
D3 — Distinguish normal variants from pathological findings	2.58
D8 — Contribute to development of anatomy learning resources	2.56
D1 — Expert-level knowledge of normal radiological anatomy	2.53
D6 — Capable of designing/delivering anatomy teaching sessions	2.52
D9 — Assess others anatomy knowledge using structured methods	2.45
D12 — Current anatomy knowledge sufficient to support reporting	2.25
D11 — Overall ready to be recognised as an anatomy specialist	2.24
D10 — Confident assuming a supervisory/consultative anatomy role	2.14

Self-perceived readiness for film reporting (Section C) produced an overall mean of 2.79 (SD = 0.68) on the 5-point scale, and readiness for radiological anatomy specialisation (Section D) a mean of 2.74 (SD = 0.67); the combined readiness mean across both domains was 2.77. Applying band cut-offs (<2.50 = not/slightly ready; 2.50–3.49 = moderately ready; ≥3.50 = very/fully ready), the majority of respondents (80, 72.7%) fell in the "moderately ready" band, while only 6 (5.5%) rated themselves very or fully ready and 24 (21.8%) rated themselves not/slightly ready.

At the item level, the two lowest-rated readiness items were both training-adequacy items: C17 ("undergraduate training adequately prepared me for reporting", mean = 1.87) and C16 ("overall ready to undertake independent reporting", mean = 2.14), while the highest-rated items concerned uncertainty management (C14, mean = 3.77) and describing pathological appearances (C5, mean = 3.75).

A similar pattern held for Section D, where D10 ("confident assuming a supervisory/consultative anatomy role", mean = 2.14) and D11 ("overall ready to be

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recognised as an anatomy specialist", mean = 2.24) were rated lowest, against high agreement that further training is still needed (D13, mean = 3.85). Regarding practical exposure, 61 respondents (55.5%) reported having interpreted no plain films in the past 12 months, underscoring limited hands-on reporting experience. When asked to identify their strongest anatomical area, chest anatomy was most frequently selected (46, 41.8%), followed by 30 respondents (27.3%) who reported no distinct area of strength at all.

Table 7: Pearson Correlation Result (Knowledge and Readiness)

Variable	N	Mean	SD	Correlation (r)	r	P	Decision
Knowledge score (Section B, /15)	110	9.47	2.36	0.119	0.119	0.214	Not significant
Combined readiness (Sections C+D, /5)	110	2.77	0.64				

A Pearson product-moment correlation was computed between total knowledge score and combined self-perceived readiness. The relationship was weak and not statistically significant, r (108) = 0.119, p = 0.214, with knowledge explaining only 1.4% of the variance in readiness. The null hypothesis is therefore retained: actual anatomy knowledge and self-perceived readiness are statistically dissociated in this sample, radiographers' confidence in their readiness is not strongly grounded in their demonstrated knowledge, showing the weak knowledge-confidence correlation reported under Objective 1.

Table 8: Welch's Independent-Samples t-Test (Readiness by Reporting Status)

Group	N	Mean	SD	Mean difference	T	p
Currently reporting (Yes)	41	2.89	0.56	0.195	1.627	0.107
Not currently reporting (No)	69	2.69	0.67			

A Welch independent-samples t-test (used given unequal group variances) found no statistically significant difference in self-perceived readiness between radiographers currently undertaking film reporting (M = 2.89, SD = 0.56, n = 41) and those who are not (M = 2.69, SD = 0.67, n = 69), t (96.12) = 1.627, p = 0.107. Although the difference favoured those already reporting (a gap of 0.195 points), it did not reach significance, suggesting current reporting activity alone is not a strong differentiator of self-perceived readiness.

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Table 9: Curricular and Structural Hindrance Items, Ranked

Item	Mean (1–5)
Undergraduate Preparation (E1–E4)	
E3 — Had training opportunities for systematic image evaluation	2.22
E1 — Undergraduate anatomy content was of sufficient depth	2.37
E4 — Clinical-anatomical curriculum integration was adequate	2.47
E2 — Undergraduate training included adequate image/case-based learning	2.55
Clinical Placement Quality (E5–E8)	
E7 — Placements included supervised interpretive/reporting practice	2.11
E6 — Received structured, meaningful feedback during placements	2.39
E5 — Clinical placements exposed me to a sufficient case diversity	2.69
E8 — Clinical supervisors were knowledgeable about reporting practice	2.78
Structural/Contextual Barriers (E13–E19), highest agreement first	
E13 — Absence of a national advanced-practice framework is a barrier	3.84
E14 — Limited access to postgraduate reporting training programmes	3.55
E16 — Resistance from radiologists/clinicians has deterred development	3.26
E15 — Medicolegal/regulatory uncertainty discourages pursuing the role	3.23
E17 — High clinical workload prevents self-directed study	3.16
E18 — Limited access to sufficient/varied cases for self-directed practice	2.76
E19 — AI-assisted reporting tools are accessible and helpful	1.96

To identify curricular hindrances, undergraduate-preparation items (E1–E4), clinical-placement-quality items (E5–E8) and structural/contextual barrier items (E13–E19) were examined. The undergraduate-preparation sub-scale returned a low overall mean of 2.4/5, with the lowest-rated item being E3 ("had training opportunities for systematic image evaluation", mean = 2.22), followed by E1 ("undergraduate anatomy content was of sufficient depth", mean = 2.37). Clinical placement quality was similarly rated low overall (mean = 2.49/5), with E7 ("placements included supervised interpretive/reporting practice") the weakest item (mean = 2.11).

Consistent with this, agreement that undergraduate curricula adequately incorporated radiological anatomy and film reporting as distinct, adequately resourced subject areas was

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low across all four E1–E4 items: only 15.5% agreed/strongly agreed that undergraduate anatomy content was of sufficient depth (E1), 19.1% that image/case-based learning was adequate (E2), 13.6% that they had opportunities to practise systematic image evaluation (E3), and 22.7% that clinical–anatomical curriculum integration was adequate (E4). These findings collectively indicate that current radiography curricula in the represented institutions incorporate radiological anatomy and film reporting only marginally, falling short of the depth and integration required to build advanced-practice competencies.

Among structural/contextual barriers, the three most strongly endorsed were E13 ("absence of a national advanced-practice framework is a barrier", mean = 3.84), E14 ("limited access to postgraduate reporting training programmes", mean = 3.55) and E16 ("resistance from radiologists/clinicians has deterred development", mean = 3.26).

Table 10: Perceived positive factor and barrier to advanced practice readiness

Influence/Barrier	Factor	n	%
Greatest Positive Influence (E20)	Self-directed study and personal initiative	34	30.9%
	Post-qualification training / workshop attendance	26	23.6%
	Mentorship from experienced reporters / radiologists	18	16.4%
	Use of digital / AI-assisted learning tools	15	13.6%
	Clinical placement diversity and structure	13	11.8%
	Institutional or organisational support	3	2.7%
	Quality of undergraduate anatomy teaching	1	0.9%
Greatest Barrier (E21)	Lack of postgraduate training opportunities	29	26.4%
	Professional resistance from radiologists	21	19.1%
	Regulatory / medicolegal uncertainty	17	15.5%
	Lack of mentorship or supervision	15	13.6%
	Inadequate undergraduate anatomy teaching	15	13.6%
	Limited clinical placement diversity	11	10.0%
	High clinical workload	2	1.8%

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Self-directed studies and post-graduate study and mentorship were the strongest positive influence, while, lack of postgraduate training, professional resistance, and regulatory uncertainties were the strongest barriers to advanced practice readiness.

Table 11: Agreement with Establishing a Formal Radiological Anatomy Specialist Designation (D15)

Response	N	%
5 — Strongly Agree	52	47.3%
4 — Agree	30	27.3%
3 — Neutral	11	10.0%
2 — Disagree	7	6.4%
1 — Strongly Disagree	10	9.1%

Support for establishing a formal "Radiological Anatomy Specialist" designation within the Nigerian radiography profession (D15) was high, with a mean agreement of 3.97/5 and 74.5% of respondents agreeing or strongly agreeing. This suggests a strong perceived need for a formal specialisation pathway as distinct from general clinical radiography practice, notwithstanding the comparatively low self-rated readiness reported under Objective 2.

Table 12: Chi-Square Test of Independence (Formal Training × Reporting Activity)

Formal Training	No, and not currently pursuing this	No, but actively seeking to do this	Yes, independently	Yes, under supervision	χ^2	p
No	25	36	9	9	27.014	< 0.001
Yes	5	3	15	8		

Note. *Pearson's chi-square test indicated a significant association between formal training and reporting activity, χ^2 (3, N =110) = 27.014, p< 0.001, Cramers's V = 0.496.*

A chi-square test of independence found a statistically significant association between receipt of formal post-qualification training and current film reporting activity, χ^2 (3, N = 110) = 27.014, $p < 0.001$, with a moderate effect size (Cramér's V = 0.496). Radiographers who had received formal training were disproportionately represented among those reporting independently or under supervision, whereas untrained radiographers were concentrated in the "actively seeking" and "not currently pursuing" categories confirming formal training as a key structural path to reporting practice.

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Table 13: Multiple Linear Regression predicting Readiness

Predictor	B	SE	T	P	95% CI
Intercept	0.8814	0.319	2.7631	0.007	[0.249, 1.5139]
Knowledge score (Section B)	0.0429	0.0201	2.1381	0.035	[0.0031, 0.0828]
Structural barriers (E13-E19 mean)	0.0866	0.0634	1.3661	0.175	[-0.0391, 0.2124]
Undergraduate preparation (E1-E4 mean)	0.5025	0.0596	8.4362	< .001	[0.3844, 0.6206]

Note. *Overall model: N = 110, R = 0.652, R^2= 0.425, Adjusted R^2= 0.409, F (3, 106) =26.131, p < 0.001.*

A multiple linear regression tested knowledge score, perceived structural barriers, and undergraduate preparation adequacy as predictors of combined readiness. The overall model was statistically significant, $F(3, 106) = 26.131$, $p < 0.001$, explaining 42.5% of the variance in readiness ($R^2 = 0.425$; adjusted $R^2 = 0.409$). Undergraduate preparation adequacy was the strongest significant predictor ($B = 0.5025$, $p < 0.001$), followed by knowledge score ($B = 0.0429$, $p = 0.035$). Perceived structural barriers were not a significant independent predictor once the other two variables were controlled for ($B = 0.0866$, $p = 0.175$). This indicates that the adequacy of undergraduate curricular preparation is the single most powerful tool available for improving self-perceived readiness.

5.0 Discussion

The findings of this study provide evidence that practising radiographers in Nigeria possess a moderate level of radiological anatomy knowledge and a moderate level of self-perceived readiness for advanced practice, but that important educational, clinical and structural limitations remain.

5.1 Radiological Anatomy Knowledge and Advanced Film Reporting

The respondents achieved a mean radiological anatomy score of 9.47 out of 15, equivalent to 63.2%, indicating moderate overall knowledge. However, performance was uneven across anatomical areas. Knowledge was stronger for several chest and abdominal items, whereas lower performance was observed for some musculoskeletal and spine-related items, including the Mach effect, elbow carrying angle, os trigonum and distal radius findings. This pattern is important because advanced film reporting requires more than

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general familiarity with anatomy; it requires the ability to recognise normal structures, anatomical variants and subtle abnormalities across different anatomical regions.

These results align with international concerns about the depth of radiological anatomy instruction in undergraduate programmes. Sendra-Portero *et al.* noted similar gaps in European undergraduate radiology education, where image interpretation competencies often lag behind procedural skills [16]. In the Nigerian context, the moderate knowledge levels and specific deficits in complex anatomical regions is in agreement with Ohagwu and colleagues' earlier identification of inadequate hands-on practice and limited integration of image-based learning in resource-constrained settings [17]. The findings reinforce the emphasis of McNulty *et al*. on the role of radiological anatomy in diagnostic image interpretation, and the literature on radiological anatomy specialisation indicates that advanced interpretation requires progressively deeper understanding of anatomical relationships, variants and their imaging appearances. The relatively lower performance in musculoskeletal and spinal anatomy in the present study therefore suggests specific areas in which continuing professional development and advanced training could be concentrated [18]

Importantly, knowledge scores did not differ significantly across years of clinical experience (H2: $F(4,105) = 0.144$, $p = 0.965$). This suggests that passive accumulation of routine clinical exposure is insufficient for deepening radiological anatomy expertise. Consistent with constructivist principles, deliberate engagement with diverse imaging material appears to be necessary to attain expertise [19].

5.2 Self-Perceived Readiness for Advanced Practice

Respondents rated themselves as moderately ready for both film reporting ($M = 2.79/5$) and radiological anatomy specialisation ($M = 2.74/5$). Lowest ratings concerned overall readiness for independent reporting, undergraduate preparation adequacy, and confidence in supervisory/consultative roles. Only 5.5% considered themselves very or fully ready. This moderate readiness profile is consistent with studies of graduate and early-career radiographers in both high- and low-resource settings [20].

The international survey by Lindgaard *et al*. found considerable variation in how advanced practice was understood and implemented among diagnostic radiographers across 25

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countries, with only 53.4% of diagnostic radiographers in their sample considering their practice aligned with advanced practice. This international variation provides useful context for the moderate readiness observed in the present Nigerian sample. Where advanced-practice roles, training pathways and professional expectations are not clearly established, radiographers may have fewer opportunities to develop confidence and experience in those roles [21].

The particularly low ratings on training-adequacy items (e.g., C17: M = 1.87) also agrees with Adejoh *et al.*'s findings on curricular deficiencies in pre-registration radiography education across transnational contexts [22]. The dissociation between actual knowledge and self-perceived readiness (H1: r = 0.119, p = 0.214) further illustrates the Dunning-Kruger effect and metacognitive gaps documented in health professions literature. The present study also found no statistically significant difference in readiness between radiographers currently undertaking reporting and those not currently reporting, t(96.12) = 1.627, p = 0.107. This suggests that simply being involved in reporting does not necessarily establish a significantly higher overall perception of readiness. Reporting experience may therefore need to be accompanied by structured education, supervision, feedback and competency assessment.

5.3 Curricular Hindrances to Advanced Practice Roles

Curricular hindrances were evident from undergraduate level through clinical placements and into professional practice. Undergraduate preparation items received low ratings (sub-scale M = 2.4/5), particularly opportunities for systematic image evaluation and image/case-based learning. Clinical placements were similarly critiqued for limited supervised interpretive practice (E7: M = 2.11). These findings corroborate the scoping reviews by Bessa *et al*. and the multinational African workforce studies highlighting the near-absence of formal advanced practice pathways on the continent [23]. The results extend earlier Nigerian-specific work by Idowu *et al*., demonstrating that structural and curricular barriers persist even among radiographers already engaged in or seeking advanced roles[24].Professional resistance from radiologists (E16: M = 3.26) and medicolegal uncertainty also remain significant barriers[25].

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5.4 Curriculum Incorporation of Radiological Anatomy and Film Reporting

Only 28.2% of respondents had received any formal post-qualification training in radiological anatomy and film reporting. Agreement that undergraduate curricula adequately incorporated radiological anatomy and film reporting as distinct, resourced subject areas was low across all relevant items (<23% agreement). This marginal integration confirms the statement of the problem guiding this research and aligns with Sendra-Portero *et al.*'s European survey findings, which noted insufficient dedicated radiological anatomy instruction even in better-resourced contexts[26].In Nigeria, the overemphasis on procedural competence at the expense of interpretive skills, as identified in the literature, remains largely unaddressed [27].

5.5 Perceived Need for Specialisation

There was strong support for establishing a formal Radiological Anatomy Specialist designation (M = 3.97/5; 74.5% agree/strongly agree), with consistent high agreement across qualification levels (H6: $p = 0.577$). This reflects growing professional awareness of specialisation as a pathway to addressing workforce gaps, consistent with international trends documented in the scoping review by Bessa *et al* *[*28] In the Nigerian context, where radiologist shortages remain acute, such specialisation offers a practical task-sharing mechanism [29].

5.6 Professional and Educational Factors Associated with Advanced Practice

Across the sample, self-directed study was the most frequently cited positive influence, while lack of postgraduate training opportunities was the dominant barrier. These perceptions reinforce andragogical principles: practising professionals are motivated by relevant, problem-centred learning and require structured support to translate experience into advanced competence [30].

Formal post-qualification training was significantly associated with current reporting activity (H4: $\chi^2 = 27.014$, $p < .001$, Cramér's $V = 0.496$), underscoring its role as a pathway to expanded practice. Multiple regression confirmed that undergraduate preparation adequacy was the strongest predictor of self-perceived readiness (H5), explaining substantial variance alongside knowledge. These results highlight the

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foundational importance of pre-registration curricular reform while affirming the necessity of structured postgraduate pathways. It shows that interventions aimed at improving undergraduate curricula are likely to have the greatest impart on advance practice readiness. This is not to diminish the importance of postgraduate training and systemic reforms, but to emphasise that the foundation for advanced practice is laid in undergraduate education, and that curricular deficiencies at this level cannot be fully compensated for by later interventions

The study identified several structural barriers. The most strongly endorsed was the absence of a national advanced-practice framework, followed by limited access to postgraduate reporting training and perceived resistance from radiologists or clinicians. Ohene-Botwe *et al*.'s multinational study across 17 African countries identified workforce retention challenges and weaknesses in professional development structures across the continent. The international literature similarly demonstrates that advanced practice develops more effectively where professional roles, education and governance mechanisms are clearly defined [31].

The present finding therefore suggests that the challenge in Nigeria is not solely one of individual preparedness. Even a radiographer with adequate knowledge may have limited opportunity to practise at an advanced level where formal pathways, supervision, governance and institutional recognition are absent.

6.0 Conclusion

This study concludes that practising radiographers in Nigeria demonstrate a moderate level of radiological anatomy knowledge and moderate self-perceived readiness for advanced practice in film reporting and radiological anatomy. However, the findings indicate important gaps in the educational and professional preparation required for progression into advanced roles. The study identified weaknesses in undergraduate preparation, particularly in the depth of radiological anatomy instruction, image- and case-based learning, systematic image evaluation and supervised interpretive practice. Only 28.2% of respondents had received formal post-qualification training in film reporting or radiological anatomy. These findings indicate that advanced-practice development cannot rely solely on routine clinical experience or individual interest. The significant association

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between formal post-qualification training and reporting activity further demonstrates the importance of structured professional development. At the same time, the absence of a significant relationship between years of experience and anatomy knowledge indicates that experience alone does not guarantee development of advanced interpretive knowledge. The strong support for formal Radiological Anatomy Specialist recognition, with 74.5% of respondents agreeing or strongly agreeing, demonstrates considerable professional interest in structured specialisation. The regression analysis further identified undergraduate preparation as the strongest measured predictor of self-perceived readiness, highlighting the importance of strengthening foundational radiography education while simultaneously developing postgraduate pathways.

Overall, the findings suggest that Nigeria has an opportunity to develop advanced radiography practice through coordinated curricular reform, structured post-qualification education, supervised clinical development and a nationally recognised regulatory framework. Such reforms should be implemented progressively and accompanied by competency assessment, professional governance and evaluation of patient and service outcomes.

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